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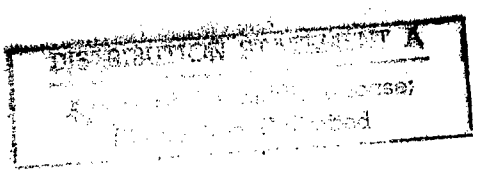
East Europe Report

SCIENCE AND TECHNOLOGY



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EAST EUROPE REPORT

SCIENCE AND TECHNOLOGY

CONTENTS

USE OF COMPUTERS IN BANKING OPERATIONS

Sofia RABOTNICHESKO DELO in Bulgarian 10 Nov 84 pp 1, 3

[Article by Todor Nikolov, correspondent for RABOTNICHESKO DELO from Topolovgrad: "Pioneers in Implementing Computer Technology"]

[Text] The collective of the okrug bank in Yambol is among the pioneers in implementing computer technology. It has been working on this for over 3 years and has achieved good results in using computers. A unit consisting of three specialists, who created and implemented two of their own projects of particular importance, has been established.

The first project, summarizing data from the regular economic information, includes all of the forms and gives summarized results at the level of administration, bank branch, and okrug branch. Monitors of the Bulgarian SM-4 are used for data input and correction, whereas the data for the bank's 50 and 51 forms are taken directly from the enterprise's outlines.

The second project, immediate payments between socialist enterprises, is also characterized by several advantageous features. It is sufficient only to mention that before, 3 to 7 days were needed to complete an interbranch payment, whereas now it is carried out in several seconds.

After it had gathered enough experience, the management decided for the first time in our country to use computers in banking activity in the Topolovgrad Rayon branch as well. The choice was not accidental. It is based on the requirements of the 22nd decree of the Central Committee of the Bulgarian Communist Party and the Council of Ministers of the Bulgarian People's Republic for intensive socioeconomic development of the villages in Strandzha-Sakar Kray. The goal is to increase sharply the quality of banking services, which naturally has an effect on the economic activity and financial status of the enterprises and workers' collectives from the rural system.

The introduction of electronic processing at the Topolovgrad bank branch began in March, in celebration of the National Party Conference. Before then, everything had been done and accounted for manually, without using any equipment at all. Despite this, the collective adopted the new method for making branch and interbranch payments in a very short period of time.

Now, after the electronic equipment has been introduced, each enterprise in a community receives a complete statement for each of its accounts on a daily basis. It reflects the entire movement of accounts-payable and accounts-receivable, the accumulated means of circulation from the beginning of the year and the current remainder. The machine controls the payment process and does not allow payments if the necessary means and free limits are not available. The accountants' collective is freed from a number of obligations.

There are significant advantages in using computers for banking operations, three of which are of especially high value. Immediate payment accelerates the process of turnover of the means of circulation. Eventual delays in payments, which until now has led to the accumulation of interest and thus made it more difficult for the payers, are now eliminated. If incorrect information has been input, the monitor reacts right away and indicates the reason for the incorrect action.

This is what Georgi Panev, director of the Sakar branch in Topolovgrad, shared with us:

"It is extremely easy now for me to be an economic manager. I can constantly follow the status of the enterprise and make concrete and rapid decisions, I can react right away."

Other economic managers share similar reactions. Introducing electronic equipment leads to a certain "unloading" of bank accountants. This means that, within the framework of the staff, certain personnel changes could take place, reducing the number of accountants and strengthening the core of inspectors.

Nikola Nikolov, director of a bank branch in Topolovgrad, indicated the advantages of the new method:

"At the present time, we are using this method only at enterprises within our own and the Yambol rural system. In a short time, however, the okrug branch will include the rest of the rayon bank branches in the okrug. I am convinced that this represents the future for all bank branches around the country, because it leads to millions of leva in means of circulation at accelerated turnover, irreproachable operative accountability, effectiveness in administrative management, and active bank control to help the collectives."

12334
CSO: 2202/3

FAILURE TO APPLY ACHIEVEMENTS OF MICROBIOLOGY CRITICIZED

Sofia RABOTNICHESKO DELO in Bulgarian 10 Nov 84 p 2

[Article by Prof Krum Rizvanov: "Why 'On a Siding'?"]

[Text] When we look for the logical relation within science as a whole, the productivity of labor, and the quality of production, we cannot help but stress the great role played by microbiology, including both agricultural and industrial microbiology. As we know, a number of branches of the national economy are closely related to the activity of different microorganisms. The foundations of the microbiological industry have been laid in our country. We are already producing antibiotics, fodder yeast, irreplaceable amino acids, enzymes, bread yeast, citric acid, gibberellin, microbial preparations for plant diseases and other harmful substances, "Nitragin Soya," etc. We must admit, however, that a lot more needs to be done in this respect.

The process of research and the implementation of the most recent achievements in microbiological science, both here and abroad, are still being slowed, and in some cases have completely stopped. There are quite a few developments in agricultural and industrial microbiology that cannot find application in production, due to certain shortcomings in the present method of implementation. In agriculture, for instance, the possibilities offered for microorganisms binding to atmospheric nitrogen have not been completely utilized. Although we have been working for many years in this direction, and quite a few theses have been successfully written on this topic, we cannot take pride in having accomplished anything more for production than what was already done by Academician Vladimir Markov about 50 years ago.

There is no justification for delaying the application of these microorganisms, of new, more promising biotechnologies and methods for obtaining effective preparations, plant inoculation, using biologically active substances from them, etc. The experience from the Soviet Union and other developed countries shows that by implementing these innovations, agriculture can realize additional income, from 100 to 300 leva per decare, because production increases not only in quantity but in quality as well: positive changes in the protein, amino acid, and vitamin composition occur.

Lately, there have been more and more complaints from those in practical areas about the unpleasant consequences of feeding animals with poor quality silage, the so-called "acidulated" or "doubly acidulated" corn silage. I would like to quote an excerpt from a letter by the management of the Agroindustrial Complex in Pazardzhik-North: "The consequences of the doubly acidulated corn silage are constitutional dyspepsia. An acidose is observed among the flock. The high milk output cows fall ill with clinical ketosis, and most of the cows have it in a subclinical form. Degeneration of the liver, infertility, and a decrease in cattle output are observed."

Here is a conspicuous example of breaking the link between science and practice, despite the fact that there is an easily accessible and economically feasible method for eliminating the pathological state among the animals mentioned above. In the Soviet Union they use the so-called corn silage prepared with a dry fermenting mixture of propionibacteria. The experiments we conducted in 1976 confirmed that this silage provides more energy and sugar for the animal's body; it protects it from an imbalance in metabolism, liver diseases, acidoses, and ketosis; it improves fertility and increases output; experience in livestock breeding, however, shows a crying need for propionic acid silage and thus we suffer losses. Why? Because the production of the dry fermentation mixture of propionibacteria has not been organized, and this could be carried out by the Plant for Microbial Preparations in Peshtera.

We have not yet reached the world standard for the most effective use of either coarse fodder or the waste products of agriculture and the food industry. These are great resources, however, for improving the fodder base, for increasing the production of livestock products and for lowering their costs. One part of the waste products could be used directly for fodder; some others could be used after certain processing. This does not always happen, however; a lot of waste products decay unused and pollute the environment. The reasons for this are, on the one hand, organizational; on the other hand, little is known about the latest, contemporary methods and waste-free technologies for the most thorough and rational use of waste products by turning them into valuable protein enzyme and vitamin nutrients for the animals, or into products for other purposes. In the Soviet Union, for example, an easily applicable, waste-free technology has been developed for processing such plant refuse as straw, etc., which is rich in cellulose and lignin, by means of fungous biomass of "trichoderma" in trenches. Thus the final product is enriched by lactic acid and protein.

What about the enormous quantities of wasted carbon dioxide? Only one part of it is used at spirits plants for the carbonation of soft drinks and wines. It could be used for obtaining ammonium carbonate, which is added to fodders in order to compensate for the shortage of proteins. For instance, from the primary wine production at the Vinprom

State Economic Trust alone about 30,000 tons of carbon dioxide could be obtained. Used as ammonium carbonate for livestock breeding, it could endow the national economy with an additional 70,000 to 80,000 tons of meat.

We are lagging behind in the production of harmless, natural, nonantibiotic preparations based on lactic acid bacteria (acidophilic or propiono-acidic) for the needs of livestock breeding. Our long-term studies have undoubtedly proven their effectiveness: the growth of cattle and poultry increases by 5 to 16 percent; a saving of fodder by 6 to 18 percent is achieved. A number of socialist and capitalist countries have shown an interest in these preparations, but not in our case. This is another fact which shows that solving the problem of increasing the productivity of labor depends on the subjective factor. In the Soviet Union they produce the so-called Propiacid preparation on the basis of acidophilic bacteria and propionibacteria. The annual economic effect of its use for the breeding of 3,000,000 broilers amounts to 600,000 leva, and for one calf--19 leva.

A number of the most recent achievements in microbiology which remain "on the back burner" could be pointed out, and this no doubt affects the economy. It is necessary to set in motion an effective mechanism for implementing scientific achievements and avant-garde technologies, as directed by the resolutions of the National Party Conference. Then there will be more, better quality production competitive with the international market.

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SELECTIONS ON ORGANIZATIONAL AND COMPUTER TECHNOLOGY

Logistics-Oriented Software

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCENTNI TECHNIKY in Czech No 2, 1984 pp 147-155

[Article by Eng Alois Petr, et al., Office Machines, Brno: "VARS/DOS--Subsystem for Logistical Operations"]

[Excerpts] 1. Subsystem Characteristics

The key objective of logistical operations is to provide the production process with timely deliveries of production means in the required assortment and at minimum cost.

The entire sphere of MTZ [logistical operations] is characterized by a wealth of information, the processing of which is considerably demanding on accuracy, expediency and reliability, a task unthinkable in modern management without the use of computer technology.

Applicational software (APV) of the MTZ subsystem is oriented toward the entire area of logistics management so as to meet its most important and time-consuming activities. Its suitable and comprehensive application should considerably contribute to improved efficiency throughout the entire area of the distribution process.

The application of VARS [multilevel automated management system] software in the area of MTZ will facilitate primarily:

--calculations for the prediction of needs for materials and the status of supplies;
--compilation of MTZ plan and categorization of supplies by the ABC method;
--automation of material storage records, including records of orders and complaints;
--computation of the need for deliveries and unused stockpiles;
--compilation of the requisite documentation for MTZ statistics and records.

Depending on deliveries of terminals, users will have access to interactive processing which will facilitate quick acquisition of the requisite

information at the relevant levels of management on the one hand, as well as a substantial reduction in printing out many output reports on the other hand.

The implementation of the specified functions will lead to the attainment of the ultimate goals of automation throughout the area of management of logistical operations, which should include primarily:

--optimization of the structure of supplies,
--improved provision of the production process with means of production,
--accelerated turnover of inventories,
--reduction in the financial volume of inventories,
--improved composition of the assortment of supplies,
--elimination of some routine activities, particularly of a recordkeeping nature.

Processing of the APV for VARS-MTZ was based on the experience gained in devising and applying the MARS-MTZ type project solution for the EC-1021 computer. APV VARS-MTZ was deepened and expanded by many new functions on the basis of findings and comments made primarily by MARS users, but also by other enterprises and organizations.

The described solution contains that part of VARS which deals with type elements used primarily at the enterprise and organization level, i.e., in the promotion of ASRP [automated system for enterprise management], particularly in enterprises which will be using hardware operating in DOS-3 or DOS-4 [disk operating system].

2. Subsystem Structure

The subsystem structure is based on a breakdown of the model catalogue of elements for ASR [automated management system] for the Seventh 5-Year Plan (ASDAT). Type elements of VARS are assigned to individual automated tasks and control functions.

The following tasks and type elements are dealt with in APV VARS:

a) ASU 421 MTZ Planning

AUL4211 Prediction of needs for materials
APO42111 Prediction of consumption

AUL4212 MTZ plan compilation
APK42121 5-year plan
APK42122 Annual MTZ plan
APK42123 Quarterly MTZ plan
APK42124 MTZ plan assessment

AUL4213 Computation of need for direct cost materials
APK21013 Compilation of annual plan proposal

AUL4214 Computation of the need for indirect materials
APO42111 Prediction of consumption

AUL4215 Analysis of inventory and consumption
APS42151 ABC analysis

AUL4216 Standardization of inventories
APK42161 MTZ standards
APK42162 Structure of inventory standards

b) ASU 422 Management of Procurement

AUL4221 Purchase orders
APK42211 Need for deliveries

AUL4222 Record of orders
APK42221 Placement of orders
APK42222 Control of deliveries

AUL4223 Providing production with materials
APK42231 Availability of materials for production

AUL4224 Record of complaints
APK42241 Defective deliveries

AUL4225 Billing and receiving
APK53221 Conversion of receipts from procurement
APO53131 Pairing/accounting

AUL4227 Record of unused inventories
APS42271 Unused inventories

c) ASU 423 Record of materials

AUL4232 Record of inventory storage
APS42321 Storage of inventories

AUL4233 Record of inventory circulation
APS42331 Inventory turnover
APS42332 List of inventories
APK42333 Inquiry-response
APK42334 Returnable packaging

AUL4235 Preparatory plans for materials
APO21346 Material storage layout plans

AUL4236 Processing of materials inventory
APS42361 Inventories

AUL4237 Computation of overvaluation of inventories
APK42371 Overvaluation of inventories

AUL4238 Printing of material price lists
APK2381 Price list printing

d) ASU 424 Reports and analyses

AUL4241 Documentation for MTZ reports
APK42411 Total statistics

AUL4242 Processing of time series
APK42421 Maintenance of time series
APK42422 Modelling of prognoses

e) ASU 429 Subsystem data base

AUL4291 Common data base (SDZ)
APK42911 Establishment and changes of SDZ MTZ

AUL4292 Local data base (LDZ)
APK42921 Establishment and changes of LDZ

6. Utilization of Common Data Base

The subsystem's software calls for linkage to selected segments:

--DBPOL data base items,
--DBORG data base organizations.

a) Data Base Items:

The ZDPOL segment offers basic information about all procured items which are processed by the subsystem.

The CENY segment facilitates the selection of a suitable type of price with a view to processing areas of individual groups of tasks.

The SKMAT segment combines data about the status and circulation of inventories of the processed items classified according to storage facilities.

The DADAP segment expands information about items by additional data, primarily from the sphere of planning and management of procurement.

b) Data Base Organizations

The ORGAN segment contains selected data about organizations with which the subsystem user cooperates (according to the FSU [Federal Bureau of Statistics] register of organizations).

The ZDZAK segment contains selected data about orders.

The subsystem's APV provides for the generation and continuous updating of the SKMAT and DADAP segments.

7. APV VARS-MTZ Linkages

The MTZ subsystem is interconnected through linkages to other VARS subsystems, whereby it takes data over from some subsystems and supplies data to some other subsystems.

The MTZ SS [subsystem] takes data over for its own processing primarily from the following subsystems:

TPV--basic primary data on an item
ORV--plan data on need for direct use material
--data on planned issue of material
--data on delivered rejects
TEP--planned data on selected items, particularly for medium-term and annual planning
ODB--requirements for procurement of commercial goods
ZAP--requirements for procurement of spare parts and materials for repair
NAR--requirements for tool-making materials
--requirements for procurement of communal tools

The results of processing done by MTZ SS are supplied primarily to the following subsystems:

EKI--data on receipt and issue of materials, results of inventory taking and overvaluation of inventories
ZAP--data on issue of PPS into use and issue of materials for repairs
ORV--completed issues of materials
NAR--data on issue of tool-making materials
JAK--data on defective deliveries and outstanding complaints
ODB--information on procurement of commercial goods

MTZ SS is also interlinked with the VARS/SMEP [system of small electronic computers] type solution, where it is envisioned to offer the possibility for combined processing, e.g., at the level of plants by means of SMEP, at enterprise level by JSEP [uniform system of electronic computers] computers.

The subsystem's APV also provides basic linkages for processing relevant problems at the middle level of management (ASRSC).

This involves primarily information on planning and statistics.

Technical-Economic Planning Subsystem

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 2, 1984 pp 155-165

[Article by Eng Miroslav Ptacek, et al., Office Machines, Brno]

[Excerpt] 6. Subsystem Introduction and Application

The application of APV TEP [technoeconomical planning]-VARS SS during the development of ASR proper can assume the following forms:

a) introduction of APV in full extent with all linkages to other VARS subsystems,

b) autonomous introduction of APV TEP SS without use of linkages to other subsystems,

c) application of certain selected parts or of the entire APV TEP SS in local design, either SS TEP or ASRP.

Table 1. Optimization and Quantification of O/V [marketing production] Plan

(1)	Chceme optimalizovat	A	A	x)N	N	N
(2)	Chceme kvantifikovat	A	A	A	A	A
(3)	Existuje dat. základna pro ivantifikaci	N	A	A	A	A
(4)	Je plán průchodný			N	N	A
(5)	Změníme výchozí podmínky			N	A	
	PK51523	X				
	PK51524	X				
	PK51525	X				
	PO51233		X	X	X	
	PO51234		X	X	X	
	PO51235		X	X	X	
	PK51212		X			
	PK51214		X			
	PK51221		X			
	PK51236					X
	PK51251					X
	Konec					X

x) First quantification run

Key:

1. To be optimized
2. To be quantified
3. Data base available for quantification
4. Can plan be run
5. Initial conditions to be changed

The form sub a) appears to be indubitably most effective, because it uses absolutely all of the generated APV of all interlinked subsystems. The

autonomous use of TEP SS comes under consideration in the case of users who either have no interest in other subsystems, or where a transitional state is involved. The latter type of application appears to be the least effective. Application of APV TEP SS in ASRP proper is possible if provision is made for outputs corresponding to initial sets of APV TEP SS. If we were briefly to outline at this point the integrated problems suitable for use in another application of TEP SS, it would involve the following problems:

--optimization of O/V plan,
--quantification of O/V plan,
--assessment and planning of effectiveness.

Table 2. Quantification of O/V Plan

(1)	Chceme kvantifikovat O/V plán	A	x)A	A	A
(2)	Existuje datová základna	N	A	A	A
(3)	Je plán průchodný		N	N	A
(4)	Změna vých. podmínek		N	A	
	PK51523	x			
	PK51524	x			
	PK51525	x			
	PO51233		x	x	
	PO51234		x	x	
	PO51235		x	x	
	PK51236				x
	PK51251				x
	Konec				x

x) First quantification run

Key:
1. O/V plan to be quantified
2. Data base available
3. Can plan be run
4. Initial conditions changed

Table 3. Assessment and Planning of Effectiveness

(1)	Chceme výpočty plánování a hodnocení efektivnosti?	A	A	A
(2)	Existuje dat. základna?	N	A	A
(3)	Je aktualizována		N	A
	PO51521	X	X	
	PO51231		X	X
	PO51232		X	X
	PO51211		X	X
	Konec		X	X

Key:

1. Are computations for planning and assessment of effectiveness required?
2. Is data base available?
3. Is it updated?

USSR Information Service Automation

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 2, 1984 p 165

[Text] The problems of automation of VTEI [scientific, technical and economic information] services in the USSR is systematically monitored and dealt with on a continuous basis. Noteworthy are the results obtained with a dual resolution of the organization of VTEI retrieval (VTEI is abbreviated in the USSR as IPS--informatsionnye protsessy i sistemi--informational processes and systems). The new dual (dual'noy) system designated as IPS ASPD-M2 is characterized by substantially accelerated retrieval of research profiles with a high degree of operational capacity. It uses the system of the EC 1033 computer with magnetic disk units with 100 MB memories. The applicational program is written in the PL/1 language. A detailed description of the processing of the program and the strategy for its introduction and application under operational conditions of industrial and other organizations appears in the Soviet periodical NAUCHNO-TEKHNICHESKAYA INFORMATSIYA, SERIYA 2, 1983, No 6, pp 16-21 (authors: G. S. Gelfman, E. I. Korolev and E. P. Maltsev) and is described in detail in the article "O dual'noy organizatsii poiskovogo massiva v IPS s avtomaticheskim indeksirovaniem" [Dual organization of mass retrieval in IPS with automated indexing].

Automated Footwear Distribution in USSR

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 2, 1984 p 165

[Text] The supplying of Soviet footwear wholesalers in the RSFSR is comprehensively automated by the EC 1022 computer system installed in Moscow since

1982 and belonging under the jurisdiction of the RSFSR Ministry of Trade. It is characterized by two subsystems: 1. distribution of footwear supplies to wholesalers; 2. optimum specification of footwear types for winter and summer seasons with the objective of suitable distribution of wholesaler deliveries to retail outlets. This made it possible to meet the demand on production expediently with a view to the interest of retail outlets in certain types of footwear, since automation by the EC 1022 computer also made possible the acquisition of more complete and expedient outlines of the current state of the interest of the populace in certain types of footwear. The generated applicational software "Ros-ASUT" for the EC 1022 computer facilitates comprehensive output processing of all requirements of footwear users in 35 hours. The plans of requirements and of actual distribution are then printed out by a line printer in 15 hours.

Data Base Control Systems

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 2, 1984 p 167

[Article by Eng Jaroslav Trnecek, Inorga, Prague: "User Criteria Regarding the Applicability and Selection of a System for Data Base Control"]

[Excerpt] 1. Introduction

Significantly increased efforts have been developed over the past 10 years worldwide, and consequently also in the CSSR, toward improving the effectiveness of computer technology applications in management. One part of these efforts is the improvement of the system of management of data bases of systems management and the generation of their most viable form so far, called databank systems. In comparison to conventional data processing, databank systems are characterized primarily by their complexity, selectivity and expedient processing, and also provide information, mutual interlinkage (which is a prerequisite for implementing a nationwide system of acquisition, storage and processing of information), multiuser access to data, less duplication in data storage, higher independence of data from application programs, etc.

It is estimated that in 1981 approximately 6,500 program systems for data base control (SRBD) were installed and utilized worldwide, approximately 130 of them in the CSSR. Among the most widely used SRBD are TOTAL (Cincom Systems, Inc), with 2,700 installations, and IMS (of IBM), with 2,100 installations, as the oldest viable systems that, however, are being pushed out by more modern systems. This involves systems based on network data structure, such as IDMS (Cullinan Corporation) with 1,600 installations, and systems containing some characteristics of the so-called relational data base, such as ADABAS (Adabas Software, Ltd) with 400 installations, and a larger number of SRBD with more limited functional possibilities, developed for minicomputers and small computers. Additionally, independent catalogue and dictionary systems for use in various SRBD as well as supplemental systems (program generators, generating programs) for the generation of output from DBS (databank systems) are available.

For many users a problem is gradually being posed by the question regarding the assessment of existing SRBD and selection of those that would best meet their needs and requirements. To the extent that an assessment of some SRBD was undertaken, it was oriented in most cases quite individually toward a single user (or a small group), and took into consideration only the relevant special requirements. In view of the fact that in the CSSR there are no organizations which prepare goal-oriented user software for individual users, there appeared the need and necessity for developing a methodological tool which would make decisionmaking easier for users on the basis of predetermined user criteria. Such a tool was developed in the form of a comparative study dealing with a comparison of SRBD designated IDMS and DBS-25. Since it is realistic to anticipate that the methodological approach and indicators used could play a significant role in the development of similar studies for yet other SRBD, this article enumerates the criteria used and briefly describes their characteristics.

In selecting a set of criteria, it was impossible to find a comparative base which would mutually evaluate some SRBD from the viewpoint of users. Some of the studies provide a well-qualified assessment of the relative level of various SRBD, but in a manner not suitable for the intended purpose. Others use application criteria such as volume of data, frequency of data selection, and also such qualitative criteria as ready availability of data, integrity of data, independence of data, etc. User criteria are mentioned in only one of the studies on the basis of the effects on the number of applications in Western countries (demands and usages of various agendas such as personnel, wages, financial, inventory management records and marketing, banking, etc.).

SMEP Communication Modules

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Slovak No 2, 1984 pp 175-188

[Article by Eng Oldrich Dulik, Eng Jan Hlusek and Eng Vladimir Hric, Research Institute for Computer Technology, Zilina: "Communication Means SMEP--CSSR"]

[Text] In the initial stage of commercial use of computer technology there was practically no long-distance transmission of data, but over the course of the 1970's the number of systems facilitating remote data processing sharply increased.

The problem of remote data processing is receiving a great deal of attention in the SMEP system of small electronic computers, and today it can be stated that the amount of developed hardware and software is adequate for allowing a wide range of possibilities in establishing terminal and computer networks.

This article briefly describes the communication modules of SMEP computers, alphanumeric and intelligent SMEP videoterminals as well as communication software for SMEP.

Communication Modules of SMEP Computers

Communication modules can be divided into three groups:

--asynchronous,
--synchronous,
--special.

Asynchronous Modules of Computers With a Common Busbar

Asynchronous modules include asynchronous adapters, quadruple asynchronous adapters and asynchronous multiplexes. These make it possible to connect a terminal or another computer to a mini- or microcomputer system with a common busbar.

However, in the establishment of homogeneous computer networks it is more advantageous to use synchronous adapters, because in asynchronous modules the entire DDCMP procedure, including safeguards for message transmission, is provided by software.

Asynchronous modules facilitate data transmission by the start-stop method and use interfaces I2 or IRPS. Interface I2 is sufficiently known through CCITT recommendations V24 and V28, and individual modules use a different subset of coupling circuits. Transition between levels is provided by TA 75 150 and TA 75 154 integrated circuits, made in Hungary.

The IRPS interface is standardized in SMEP and facilitates the asynchronous transmission of data through a 4-conductor cable in duplex mode over a maximum distance of 500 m at maximum speed of 9,600 bit/s; current from 15 to 25 mA corresponds to state "1", and current from 0 to 5 mA to state "0". Systems connected by a current connector use galvanically separated grounding.

Asynchronous Adapter (ASAD-CM 6002)

ASAD makes it possible to connect to the computer system another device through the IRPS or I2 interface. Both of these interfaces are led out to a 30-knife connector, and the selection of one of them is made by insertion of the relevant cable.

Basic technical specifications:

--number of connectable devices	1
--interface	I2 or IRPS (40 mA)
--type of transmission	start-stop
--transmission mode	simplex half-duplex duplex
--transmission speed	50, 100, 200, 300, 600, 1200, 2400, 4800, 9600 bit/s (selectable by switch for transmitter and for receiver)
--number of information bits	5, 6, 7 or 8

--number of start bits	1
--number of stop bits	1, 1.5 or 2
--transmission control	paired or unpaired parity (not necessary)
--power feed	+ 5V/2.5 A
	+ 12 V/0.2 A
	- 12 V/0.45 A
--structural design	2-connector plate

Quadruple Asynchronous Adapter (Q-ASAD)-CM 8512

The Q-ASAD makes it possible to connect to the computer system four devices through interface IRPS and I2 (with random combination of these interfaces). Functionally it appears as four ASAD's with the following differences:

--it facilitates transmission speeds of up to 19,200 bit/s (ASAD only 9,600 bit/s);
--it represents 1 load on the busbar (4 ASAD's = 4 loads);
--it does not allow operation in half-duplex, because it uses a limited set of V24 interface circuits;
--it does not allow selection of different speeds for transmitter and receiver.

Basic technical specifications:

--number of connectable devices	4
--interface	IRPS or I2
--transmission method	start-stop
--transmission mode	simplex
	duplex
--transmission speed	≦ 10,200 bit/s
--number of information bits	5, 6, 7 or 8
--number of start bits	1
[--number of stop bits]	1 or 2
--transmission control	paired or unpaired parity (not needed)
--power feed	+ 5 V/2.5 A
	+ 12 V/0.2 A
	- 12 V/0.45 A
--structural design	2-connector plate, distribution unit and interconnecting cable

Asynchronous Multiplex (AMU)-CM 8511

This asynchronous multiplex makes it possible to connect to the computer system 8 (with potential expansion up to 16) devices via interface IRPS or I2. Circuits for modem control do not facilitate transmission in half-duplex or transmission along retranslation channels.

AMU provides for flexible program control of the parameters of each line, whether transmission speed, number of information bits in a symbol, number of stop bits or selection of parity.

Basic technical specifications:

--number of connectable devices	8 (16)
--interface	IRPS or I2 (modular by 8)
--transmission method	start-stop
--transmission mode	duplex simplex
--transmission speed	≦ 9,600 bit/s
--number of information bits	5, 6, 7 or 8
--number of start bits	1
--number of stop bits	1 or 2
--transmission control	paired or unpaired parity (not needed)

--power feed	+ 5 V	- 12 V	+ 12 V
AMU - A, B	5.5A	0.2 A	0.15 A
AMU - C, D	6 A	1 A	-

Structural design: AMU is located in a systemic unit which actually is a modified UBM [all-purpose interconnection block] (CM 0101). Control logic of the 8-channel AMU is located on one 2-connector plate and part of the circuits of the series interface is located on the printed circuit plate of the distribution panel, which is suspended in the rear part of the stand.

The asynchronous multiplex is produced in the following versions:

AMU-A: 8-channel multiplex with I2 interface
AMU-B: 8-channel expansion for I2 interface
AMU-E: 16-channel multiplex with I2 interface (AMU-E = AMU-A + AMU-B)
AMU-C: 8-channel multiplex with IRPS interface
AMU-D: 8-channel expansion for IRPS interface
AMU-F: 16-channel multiplex with IRPS (AMU-F = AMU-C + AMU-D)
AMU-G: 16-channel multiplex, 8 channels have IRPS interface, 8 channels I2.

Synchronous Modules of Computers Using a Common Busbar

Synchronous adapters form a communication channel between synchronous modems and the common busbar of computer systems. They facilitate mutual interconnection of computer systems, or connection of terminals, provided that the terminal is capable of operating with the requisite procedure.

Synchronous Adpater (SAD)-CM 8506

The transmitting part of a synchronous adapter performs parallel-series conversion of data and generates the correct format of the block being transmitted, depending on the selected type of procedure. Its receiving part performs series-parallel conversion of data, decodes control symbols FLAG, ABORT, SYN and secondary station address. In view of the fact that SAD has no direct access to memory and its buffer memory is only 1 byte, the received symbol must be read in time 1/speed x 8 + n, where n is the number of inserted zeroes.

Blocks are protected by cyclic code, providing good protective properties and a relatively simple technical implementation.

SAD in HDLC procedure also provides for the automatic insertion of zeroes into transmitted data and, conversely, eliminates inserted zeroes from received data.

Basic technical specifications:

--number of connectable devices	1
--interface	I2
--transmission method	synchronous
--transmission mode	duplex half duplex
--transmission speed	≦ 9,600 bit/s
--transmission procedures	HDLC, DDCMP
--transmission protection	CRC-10, CRC-CCITT
--power feed	+ 5 V/3.5 A + 12 V/0.1 A - 12 V/0.15 A
--structural design	SAD-B is designed on one 4-layer 3-connector plate

Synchronous Adapter-D (SAD-D)

SAD-D corresponds from the functional aspect to SAD during operation in DDCMP procedure, but its circuit design is much more effective. It is designed on a 2-connector plate and can be built into terminal stations based on SM 50/50.

Synchronous Adapter-BSC (SAD-B)-CM 8517

SAD-B in cooperation with program emulator 7921 or 8514 facilitates the interconnection of SMEP and JSEP computer systems. SAD-B with emulator 8514 also facilitates the interconnection of SMEP mini- and microcomputers.

It consists of two independent devices--the synchronous adapter proper and communication arithmetic--which are connected to the common busbar via a common block for contact with the busbar and, thus, they represent only a single load.

The function of the block for connection with the busbar is to decode the address of one of eight registers, generate disconnection from receiver and transmitter of the synchronous adapter (communication arithmetic does not generate interruption).

SAD-B facilitates transmission in BSC procedure in both 7- and 8-bit code. In the former case the blocks are protected by longitudinal parity, in the latter case by cyclic code.

Basic technical specifications:

--number of connectable devices	1
--interface	I2
--transmission method	synchronous
--transmission mode	half duplex
--transmission speed	≦ 9,600 bit/s
--transmission procedure	BSC
--transmission protection	LRC-8, CRC-16
--power feed	+ 5 V/2.5 A + 12 V/0.1 A - 12 V/0.15 A
--structural design	SAD-B is designed on one 4-layer 2 connector plate

Communication Module of the SM 50/40 Microcomputer

Terminals or other computer systems are connected to the 50/40-1 microcomputer system by means of a module of MPASV programmable serial output adapters using the IRPS or I2 interface.

This module consists of two parts:

--data transmission block
--control block.

The data transmission block contains busbar transmitters and receivers, all-purpose synchronous-asynchronous transceivers (USART's), IRPS and I2 interface circuits.

The control block provides for address decoding, interruption generation, selection of speeds, and generates control signals required for cooperation of MPASV with the microcomputer system. MPASV contains four duplex channels. The USART operation is program controlled. Data and instruction input occurs through the same input points and, for that reason, differentiation is done by zero bit. The transmission can be synchronous or asynchronous.

Special Module-Communication Processor (KOMPRO)-CM 2401.0510

Neither the synchronous nor the asynchronous communication module has direct access to memory, and thus their operation puts a considerable load on the processor. The role of KOMPRO is to control the operation of asynchronous multiplexes or synchronous adapters with minimum participation of the system's processor.

KOMPRO functioning is determined by a microprogram which during system initiation introduces the operating system into the control memory of KOMPRO. Communication between microprogram and operating system occurs by means of four control and state registers.

The communication processor can control up to 6 eight-line multiplexes, i.e., 48 asynchronous lines.

The interface can be IRPS or I2, or a combination of both. KOMPRO regularly scans all multiplex lines at a rate determined by the KOMPRO timer. KOMPRO is connected with the multiplexes only through the common busbar, making it easy to build this arrangement into the system. Similar properties apply to cooperation of KOMPRO with SAD, with up to 16 of the latter.

Basic technical specifications:

--length of microinstruction	16 bits
--number of data bits	8
--timing period	50 microseconds
--cooperation with memory	DMA
--max. number of controlled AMU	6 (i.e., 48 lines)
--max. number of controlled SAD	16
--max. number of KOMPRO in system	16
--power feed	+ 5V/8.5 A
--structural design	2- and 3-connector mutually interconnected plates

SMEP Alphanumeric Videoterminals and Intelligent Terminals

The VUVT has developed several alphanumeric videoterminals which can operate in connection with SMEP mini- or microcomputers in local mode or in long-distance mode through data transmission systems. Intelligent terminal stations were developed on the basis of 8- and 16-bit SMEP microcomputers and were introduced into production in 1983.

Alphanumeric Videoterminal-CM 7202

The CM 7202 videoterminal is an all-purpose auxiliary input/output device for communication with a computer in dialogue mode.

One of two types of contactless alphanumeric keyboards serves for input. It facilitates printout of the displayed information, or of its selected part by an attached EC 7181 mosaic series printer.

It permits simultaneous display of 1,920 symbols in the most routinely used format of 80 symbols per line on 24 lines.

The set of symbols includes 96 symbols of upper case Latin and Russian script and special symbols.

It comes equipped with the CCITT-V 24 series interface, interface of current coupler 40 mA or a parallel-radial interface. Transmission is asynchronous.

Basic technical specifications:

--picture screen dimensions	31 cm diagonally

--number of simultaneously displayable symbols	1,920
--display format	80 symbols x 24 lines
--set of symbols (code KOI-7)	96 (Latin and Russian script capitals, numbers and special symbols)
--editing functions	erasure of display, erasure till end of line and till the end of display, substitution of symbol, tabulation, moving display up by one line (SCROLL)
--cursor movements	in four directions, setting into 1st position of display, into 1st line position
--operating mode	autonomous (LOCAL) automatic in half duplex and duplex, SEND instant block transfer of prepared information into the computer, TLAC [PRINT] printout of delineated part of displayed information by printer
--interface	a) series (V 24) up to 9,600 bit/s series through current coupler up to 9,600 bit/s b) parallel-radial 150 kbyte/s

Simple Alphanumeric Videoterminal-CM 7601

The simple alphanumeric videoterminal is intended as a reference device for complementing minicomputers and microcomputers. It is the simplest functional variant of the SM 7202 display retaining its essential structural elements. It makes it possible to accommodate in its casing up to seven modules in addition to the control module of the simple alphanumeric videoterminal and build up in this manner intelligent terminals based on modules of the SM 50/40-1 and the SM 50/50-1 microcomputer systems. The basic parts of the videoterminal--the display unit, keyboard, power supply, ventilation unit and its 8-position casing--form one mechanical unit. The logic part of the simple videoterminal is designed on one 2-layer plate with dimensions 250 x 280 mm with two direct 96-pin connectors.

Technical specifications:

--useful display screen area	200 x 120 mm
--number of lines	optional 16 (or 12)
--number of symbols per line	optional 64 (or 40)
--capacity of display memory	1 kB
--type of symbol generation	dot matrix 5 x 7
--number of displayable symbols	64 special Latin script symbols of KOI-7 code, or 96 special symbols of Latin and Russian script

The number and type of employable symbols is determined by the type of keyboard used and by the symbol generator.

Operating modes:

a) autonomous--entry into system through keyboard,
b) remote--entry into system from computer.

Editing functions	cursor movement in four directions cursor move to beginning of image cursor move to beginning of line tabulation, moving information in display by one line up
Interface	IRPS, I2 at transmission speeds of 600, 1,200, 2,400, 4,800 and 9,600 bit/s.

Videoterminal Facilitating Display of Graphs-CM 7202.M1

The videoterminal facilitating display of graphs makes it possible to display alphanumeric information together with two graphs and graphic symbols on the screen.

Functional characteristics:

Alphanumerics:

--number of lines	24
--number of columns	80
--set of symbols	160 symbols, upper and lower case KOI-7 letters, 12 control symbols, graphic symbols
--special properties	moving of image one line up or down (SCROLL), audio signalization, erasures, tabulation, pointer control
--symbol matrix	7 x 7 dots

Graphics:

--raster	512 horizontal x 236 vertical dots
--graphs or histograms	two independent graphs, each controlled separately
--grid	512 vertical lines and 238 horizontal lines, each controlled separately
--graphic pointers	512/graph, total 1024. Each graphic pointer is individually controlled

Special functions:

--information hold on the screen	permits interruption of data transmission to display for prolonged study of information on the screen
--display identification	display will respond with ESC/E after receiving ESC Z

Keyboard:

--distribution	Latin or combined (Latin, Russian) script
--strike control	audio signalization when key is depressed
--error prevention	protection against transmission of an error code when multiple keys are depressed simultaneously
--special keys	individual control keys for special or common use of control functions such as ESC, TAB, SCROLL, BACK, SPACE, BREAK, LINE FEED, RETURN, COPY REPEAT
--auxiliary keys	independent control keys for transmission of 2-symbol escape sequences and special symbol codes

User operation:

--intensity	adjustable brightness of symbols and graphs
--initial logic zeroing [reset]	connecting of display to power automatically resets to alphanumeric mode
--[operating] mode	full duplex, full duplex with simultaneous display of data on the screen and local mode by means of rotary switches

Interface characteristics:

--type	20 mA current coupler or I2 interface

Transmission speed:

--full duplex, full duplex with display	common transmitting and receiving transmission speed 100, 200, 300, 600, 1,200, 2,400, 4,800, 9,600 bit/s
--full duplex, separate transmission speeds	independently chosen transmitting and receiving transmission speed 100, 200, 300, 600, 1,200, 2,400, 4,800, 9,600 bit/s

Transmission:

--10-bit byte length	for all transmission speeds
--parity	not controlled during reception

In most applications the terminal will be connected to the computer and will operate in full duplex mode. Data transmitted from the terminal's keyboard are received by the computer, which processes them and at the same time sends them back to the display unit (echo system).

Another mode of communication is full duplex with simultaneous display on the screen (LOCAL COPY). Data transmitted from the terminal's keyboard are

simultaneously transmitted to the computer and to the terminal (there is no need for echo).

In LOCAL transmission the terminal is disconnected from the computer (the keyboard transmits only into the terminal). It is used during maintenance for training purposes, etc.

The terminal uses the KOI-7 code. In the version of displaying both Latin and Russian script the terminal switches from Latin to Russian script upon receipt of code "SO" and vice versa upon receiving the code "SI."

When power is switched on, the terminal is adjusted to Latin script mode.

The keyboard serves for the generation and transmission of codes, instructions and alphanumeric symbols into the computer or into the terminal. The keyboard is divided into the basic (alphanumeric) and supplementary (numeric) field.

The generation of some code instructions that have no independent key is facilitated by the key "CTRL" in connection with the relevant alphanumeric key.

Terminal Station Based on SM 50/40-1

This terminal station is an intelligent terminal device intended for interactive contact between the operator and the computer system. It can serve for the acquisition and preprocessing of data in processing production or administrative agenda, as a terminal for the booking and registration of reservations in transportation, billeting or therapeutical institutions, as an office terminal, commercial terminal, etc. In its maximum configuration the terminal station includes:

--terminal station control built into alphanumeric videoterminal with a keyboard,
--three simple alphanumeric videoterminals with CM 1601 keyboard,
--external floppy disk memory with 512 kB capacity,
--mosaic printer.

The control terminal is designed on the basis of modules of the SM 50/40-1 microcomputer system with a minimum of 32 kB of RAM memory (maximum memory capacity is 64 kB), modules of floppy disk control, module of programmable serial adapters and module of a simple alphanumeric videoterminal. Five devices can be connected to the terminal via an IRPS interface, or 12 and 4 devices through parallel IRPS interface. Serial channels are as follows:

--one channel for connecting the alphanumeric videoterminal of the control terminal;
--three channels for connecting of simple alphanumeric videoterminals CM 1601;
--one channel for connection to a hierarchically higher computer.

Parallel channels:

--one channel for connecting of mosaic printer;
--three channels are kept free for connection of random devices with IRPS interface (e.g., perforated tape reader, perforated tape punch, etc.).

With the exception of the printer, all peripheral systems cooperate with the control terminal through interruption mode.

Terminal Station Based on SM 50/50-1

The SM 50/50 terminal station is devised with the aid of the CM 1601 simple alphanumeric videoterminal into which was built, in a casing for eight 2/3 SMEP plates, a more effective power feed system and a ventilation unit. Other parts of the videoterminal were also modified, e.g., the control panel and the field of connectors for leading out of interfaces in the rear. The tilting casing is formed at its bottom side by a matrix plate, the first position of which is reserved for the logic plate of the independent videoterminal, and other positions use parallel distribution of systemic interface signals--common busbar.

Distribution of the common busbar signal is defined and makes it possible to insert into the casing all 2/3-plate modules of the SMEP system devised for connection to a common busbar. This arrangement makes it possible to devise various configurations within terminal stations, depending on the requirements for a specific application.

The functions of plates used in the SM 50/50 terminal station are as follows:

Simple videoterminal contains the logic part of CM 1601 display, makes it possible to select symbol display in 16 lines with 64 symbols each, or in 12 lines with 40 symbols each.

The SM 50/50 processor contains the complete circuitry of the processor designed on the basis of 4-bit microprocessor sections. It provides a basic and expanded instructional set identical to that of the SM 4-20 computer system, but does not contain instructions for a floating decimal point.

The processor also provides for controlling the operation of the common busbar and of the interruption system.

Organization of memory with CACHE memory is an optional module for the processor and facilitates expansion of the memory space to 124 K words. The CACHE type memory with a capacity of 1 K words substantially accelerates access to information in the working memory storage.

A combined module contains permanent memories, the contents of which provide for functioning of the system's three submodules: the lead-in submodule, a serial interface for the operator's terminal, and a simple timer.

The semiconductor working RAM memory storage has a capacity of 64 K words using parity circuits for protection of information. The internal modularity of memory is 16 K words and it is possible to block the last 4 K words of address space reserved for addresses of registers of peripheral devices.

Combined working RAM/EPROM memory storage contains the memory field of RAM memory with a capacity of 16 K words and EPROM memory with a capacity of 12 K words. Internal modularity of EPROM memory is 4 K words. RAM memory is again dynamic.

Both types of memory can be addressed via switch-overs on the plate into the 0-128 K words address space in a random RAM/EPROM combination.

The parallel adapter (PAD) is an interface module which facilitates the connection of peripheral devices with parallel transmission, which in the SMEP system bear the designation IRPS. It is used advantageously in systems calling for higher transmission speeds.

The IMS 2 connecting unit makes it possible to connect measuring instruments operating with IMS-2 interface to an SM 50/50 terminal station. At the output of the connecting unit is the IMS-2 busbar, which passes in series through a set of instruments, controls them and enters the measured values into the terminal station's computer system.

The functioning of the ASAD and Q-ASAD modules used in the terminal station was described in the preceding part.

The terminal station has been developed and will be produced in three versions:

The first version contains only the basic plates of the system (videoterminal logic, processor, combined module) and is intended for expansion to meet the user's requirements.

The second version has a configuration for the PPPD1 system for the acquisition and preparation of data. It facilitates the connection of four additional acquisition stations through Q-ASAD, floppy disk and additional expansions represented by two free positions in the plate casing.

The third version is intended for a system of data acquisition from measuring instruments with IMS-2 interface. It again contains a floppy disk and the IMS-2 connecting unit. Expansion is made possible through one free position in the plate casing.

It can be expected that in the future applicational programs for terminal stations will expand to other applications in various branches of the national economy in connection with devising additional modules of the SMEP system and the concurrently developed applicational software.

SMEP Communication Software

The SMEP system offers a wide assortment of software for use of the above-described hardware. This software can be divided into three basic groups:

--communication means controllers,
--system controlling SMEP computer networks (SYRPOS),
--programs facilitating interconnection between JSEP and SMEP.

Communication Means Controllers

Controllers for input/output systems are supplied as standard equipment of operating systems. We shall present an outline of operating systems for SMEP minicomputers and specify which operating system for a given communication system is supplied with a controller as standard equipment.

FOBOS

This is a single user twin-task operating system for foreground/background operation. It is intended for control of processes in real time with quick response to the foreground and potential for processing of data in batches, or preparation of data for the background. Drivers for ASAD can also be implemented.

DIAMS

This is a multiuser multitask operating system operating in time-sharing mode. Its component is a module for control of tree-structure sets. The system can use only the MUMPS user language.

MUMPS is a dialogue language with strong functions for the processing of chains and with direct access to the system's data base. From among communication systems it contains a controller for ASAD, Q-ASAD, AMU.

DOS RV V2

This is a real time disk-oriented operating system. It is a multiple user system intended for operation in multiple task mode for dynamically changing media. A considerable number of all-purpose programs expands the possibilities of this operating system not only for operation in real time for control of technological processes, but also for generation of information systems, operation in computer networks, data processing, etc. It is intended for minicomputers with up to 128 M words working memory storage. The memory version of this system represents the independent MOS-RV2 operating system. It can contain controllers for communication systems ASAD, QUASAD, SAD, AMU, KOP.

MOS RV2

The MOS RV2 does not contain a system for maintenance of sets and finds application wherever use is made of a stable set of programs tuned on large systems (SM 4-20, SM 52/11) with minimal changes, which are to provide for automatic

(or semiautomatic) acquisition of data in real time, preprocessing of data and on-line transmission of data to a hierarchically higher system.

It can contain the same controllers as the DOS RV V2.

DOS KP

The DOS KP belongs to the group of operating systems with time-sharing. It is a multiple user system in which up to 63 users can operate simultaneously. Its key advantage is ease of operation. It calls for a minimum of 64 K words of working memory storage. From among communication systems it is possible to implement ASAD, QASAD, AMU.

SYRPOS--the set of programs bearing the designation SYRPOS (System for Control of Computer Networks) enables users to operate in computer or terminal networks. This packet of programs works under the operating systems DOS RV V2 and MOS RV2 and its mapped or unmapped version enables computer systems using these operating systems to be connected into a computer network. This makes it possible to connect into a computer network all the SMEP minicomputer systems. As a communication system can be used an asynchronous adapter (ASAD, QSAD), a synchronous adapter (SAD), or an asynchronous multiplex (AMU). SYRPOS facilitates transmission in half-duplex or full-duplex mode with modem or via current coupler interface. SYRPOS provides for the performance of many functions, which include:

--communication between terminals,
--sharing of systems,
--communication between tasks,
--network monitoring functions,
--network testing,
--introduction of system via line,
--operation with sets.

Communication among terminals enables the user to gain interactive access into the network by means of a service program. The user of a local terminal can exchange messages with other users of the terminal network.

Herein, it is possible to operate in two modes:

--dialogue mode,
--single line mode.

The system-sharing function enables the user to gain access to all the systems found in the computer network. This means that he can use the systems of a remote center if logic connection exists between a local and a remote center.

The nature of intertask communication makes it possible for two varying programs in the network to exchange data via a logic line, whereby these programs can be written in the languages Macroassembler, FORTRAN IV-PLUS, BASIC

PLUS-2 and COBOL. The performance of intertask communication itself resembles the performance of an input/output operation. The logic line between two programs is handled as an input/output channel used for sending and receiving data. Intertask communication call-up is activated by programs which call for local modules to provide for performance of the specified functions.

The network program specifies in the call-up the parameters through which information is imparted to local modules. The form of network call-up which the programmer can use depends on the source language. These can be actual calls, stored segments or systemic directives. Equivalent call-ups of intertask communication in various programming languages are always translated into an identical set of messages. The computer network provides the network program with the means to perform the following functions:

1. Request for logic line
2. Acceptance of request for logic line
3. Approval or denial of request for logic line
4. Sending of data
5. Receiving of data
6. Sending of interrupted data
7. Receiving of interrupted data
8. Terminating logic line operation.

The assembly function enables the user to monitor the momentary status of any of the network's centers, and also its momentary operation. The administrator of the system or the user can use the network's service programs to obtain the following information at the terminal:

--the momentary state of local or remote centers or physical lines;
--momentarily defined values for the configurational data base and other static parameters;
--contents of various counters maintained by the system for monitoring network operations.

The user also has the possibility of recording certain significant network events on the operator's console, or even into a special set. The types of these events include connection or disconnection of a line or of a center. Counters are used for monitoring other types of events and errors. The system administrator can periodically record the states of these counters into a special set or print it out on a terminal to acquire detailed information about the operation of logic lines, e.g., how many requests for connection were dispatched and how many were received. The counters also record some significant activities in the transport layer, such as, e.g., how many types of errors were found in packet headings, how many failures in line initiation, etc.

The function for system introduction via a communication line makes it possible to introduce the MOS RV operating system to a remote center. The activation of ROM memory in a remote system and eventual issuing of an order in a hierarchically higher center introduces the OS MOS RV image from the

host system into the memory of a remote computer. After completion of the introduction, the MOS RV system activates itself and is capable of instantaneous operation in the network.

The function for working with sets makes it possible for the user to operate with sets at remote centers of a computer network. Depending on whether or not the user is a privileged participant in the network at any given center, he is entitled to operate with the sets at the center. A nonprivileged participant is usually entitled only to read the sets. A privileged participant can enter a set, transcribe it, close it, or even erase it from systems at remote centers.

Testing devices make it possible to verify the functioning of both hardware and software of a given complex under full operation.

Emulators

The interconnection of SMEP and JSEP computers from the program aspect is done by means of programs, routines (emulators) which facilitate the exchange of data between a SMEP computer and a host JSEP computer. This involves two routines which work under the DOS RV operating system, thus making it possible to interconnect not only a SMEP computer with a JSEP computer, but actually the entire SMEP computer network (SYRPOS) with a JSEP computer.

Current efforts deal with establishing connection with JSEP systems as host systems in the form of EC 7921 and EC 8514 emulators. Hereby the EC 7921 is an interactive routine enabling a SMEP computer program to communicate with a host JSEP computer. An EC 8514 type batch routine enables users of SMEP system terminals to transfer data sets to the host JSEP computer, or to another SMEP computer.

Wang's PIC

The Wang Company is headquartered in Lowell in the state of Massachusetts. The company introduced recently in nearby Boston its new PIC (Professional Image Computer) system, which is intended for the generation and processing of data, texts and images. The basis of the system is the Wang PC, with the following components:

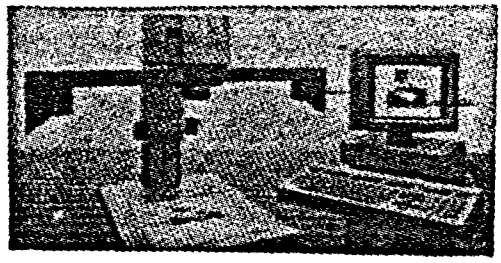
--a 12-inch black-and-white monitor with 800 x 600 pixels imaging precision;

--a scanner with its own illumination system operating on an area of 25 x 35 cm. Drawing accuracy is given by 1,728 x 2,200 pixels;

--a 5 1/4-inch Winchester disk with a capacity of 10 MB. After compression of information, 50 to 120 KB of memory are needed to keep the image in the memory, so that one disk can contain about 100 images;

--a thermoprinter which prints out a page in 40 seconds;

--an LIS-12 laser printer (Xerox product), if the PIC station is connected to the system VS, OIS or Alliance, with a speed of 12 pages per minute.



The PIC comes equipped with an experimental optical system which in several seconds digitalizes a drawing, a photograph or graphic representation, and any other documentation on paper. It enters the contents into the memory, can reduce or enlarge the image, divide it and combine it with some other text.

While the PIC is an outstanding device, it poses three disadvantages:

--price: it will cost around Fr 200,000. First deliveries, for the time being in the United States only, will not start until February 1984;

--it lacks a "mouse," so that handling of documentation on the screen must be done by keyboard;

--the PIC is a "passive" system. It does not facilitate the handling of documentation or parts of documentation on the display screen.

New Soviet Microcomputer

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 2, 1984 p 189

[Text] The new Soviet SM 1300 microcomputer, supplied under the jurisdiction of V/O ELORG, is intended primarily for the automation of industrial production processes, and its software is related to that of the SM-4 minicomputer systems. Its working memory storage has a capacity of 64 KB, it operates at a speed of 800,000 operations per second, and its interface is of the common busbar type. Its dimensions are 388 x 270 x 80 mm, and it weighs 5 kg.

Corrections to VYBER Article

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 2, 1984 pp 192-193

[Excerpt] The column "Mini, mikro" in this year's first issue of VYBER contained an article by Eng V. Vojtech, "Outline of the 16-Bit SMEP Series Available in 1984." We ask the readers, in addition to correcting several small errors, to perform some updating necessitated by the time which elapsed between the writing of the text and the publishing of the issue.

p 40--replace the text of chapter 6.5, "Basic Software," by the following text:

The following software can be supplied on special order with the SM 50/50 terminal station with memory capacity of 32 K words:

--FOBOS 2 operating system,
--MOS RV operating system,
--other software products supported by the operating systems listed above.

p 41--module SM 4220: correct specification for ordering is SM 4220 (not CM 5605).

p 42--CM 5403 module: cable designation should be 8XF 641 098 (not 0XF....).

p 45--SM 1106-S module: designation for ordering should be SM 1106-S (not SM 11006-F),

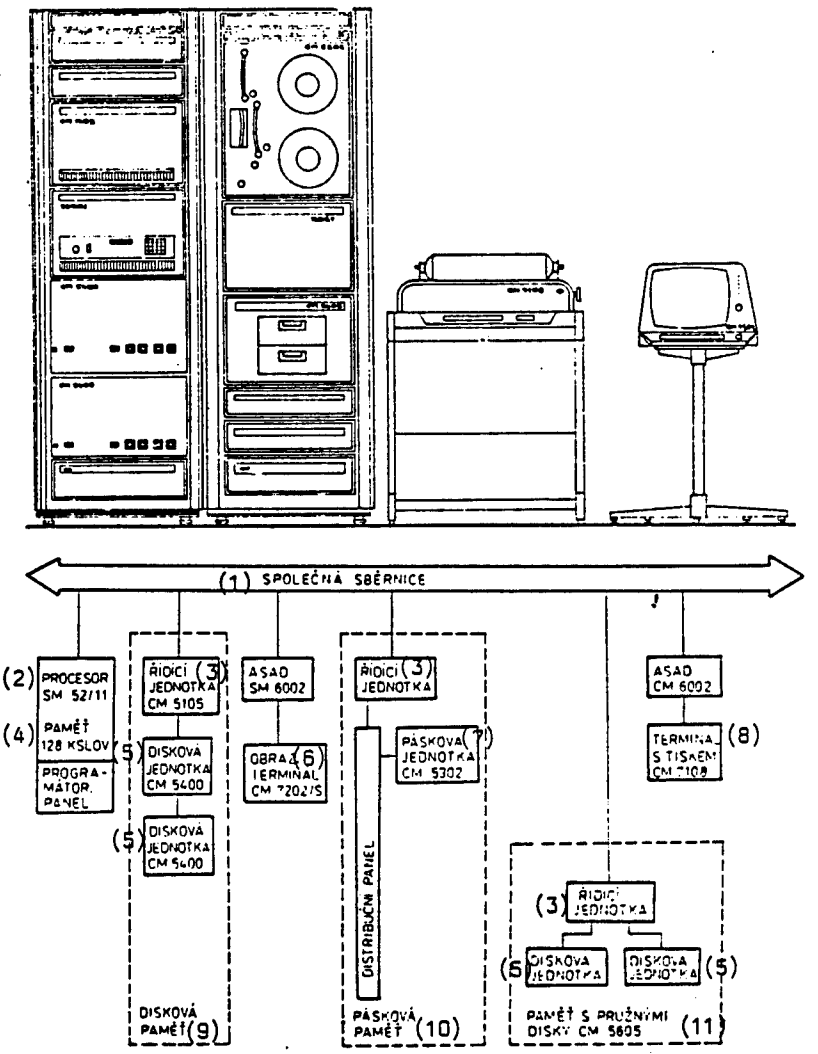
--SM 1101-P module: designation for ordering should be SM 1101-P (not SM 1106 and SM 1101-B).

pp 54, 55--designation of terminals on the first line of Tables A and B should be:

CM 7202/S, CM 7202.M1-A;
CM 1601, CM 7202.M1-G.

pp 59, 60--description for Figures 1 and 2 should read: SM 4-20 Minicomputer (not SM 4-20 Microcomputer).

p 61--incorrectly inserted plate; the correct figure is shown below. We offer to the readers our apologies for the listed corrections.



[Correction for Figure on p 61]

Key:

1. Common busbar
2. Processor
3. Control unit
4. Memory 128 K words
5. Disk unit
6. Display terminal
7. Tape unit
8. Terminal with printer
9. Disk memory
10. Tape memory
11. Memory with floppy disks

New JSEP Systems

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 2, 1984 pp 195-196

[Article by -js-: "JSEP 3--Next Stage of Development of the Uniform System of Electronic Computers"]

[Text] JSEP 3 systems are developed on the basis of the relevant project adopted by the board of key JSEP designers and by the Intergovernmental Commission for Computer Technology in 1976-77.

The project orients the continued development of JSEP systems toward the following areas:

--improved effectiveness (i.e., particularly in the output to price ratio) of JSEP 3 computers in comparison to JSEP 2 computers;

--improved technical (output capacity, speed of data input/output, memory capacity, number of connectable terminals, etc.) and reliability features of these computers;

--increased contribution by computers to the national economy by use of specialized technical means, use of programmable technical means built into technical means for systems control and organization of systems into networks;

--continued improvements in the effective solution of tasks, particularly in the area of utilization of data banks, e.g., by introducing additional problem-oriented languages;

--reduce the "overhead" for the operation of hardware and software by high reliability through improved diagnostic methods and providing of reserve capacities.

The recommendation for continued development of JSEP systems anticipates continued substantial development of the structural and technical design of systems, enabling users to utilize already existing programs and peripheral systems.

The basic organization of JSEP 3 data processing systems leads to:

--wide utilization of LSI circuits, which leads to reduced dimensions of systems, lower power input, improved reliability and higher speed;

--wide use of LSI memory circuits--up to 4 Kbit for very fast small capacity memories of processors and 64 Kbit (and more) for main working memories of large capacity;

--use of new memory elements operating on the basis of new principles for design of file memories of very large capacity;

--use of functionally oriented processors and subsystems as basic elements of the structural design of systems. Also implementation of selected systemic functions (e.g., data control, input/output organization) through hardware for improved effectiveness;

--use of problem-oriented processors for effective handling of partial tasks such as, e.g., processing of symbols, matrix calculations, control of sets, etc., for improved performance of the system;

--use of means for structural design of networks for remote data processing for organization of distributed systems and networks for acquisition, storage and processing of information;

--use of built-in devices for control of data banks and providing of effective methods for handling large sets (information bases);

--potential for more flexible changes in hardware and software and their tuning to a certain area of application while maintaining their compatibility with existing hardware and applicational programs.

The development of JSEP 3 systems is envisioned to occur in two stages.

The first stage is represented by current development in the following two directions:

--development and introduction of a new base of elements; the orientation in this direction is toward microelectronic elements in I^2L, TTL and ECL technologies;

--development of specialized processors and methods for their programming; transfer of selected functions of operating systems to hardware.

The computers under development will be compatible with JSEP 2 computers with the potential for connecting specialized processors (matrix, symbol, etc.), providing reserves--devising of multiprocessor systems, providing for operation in networks, providing for performance of selected functions of operating systems by hardware (circuitry). Efforts are being developed at the same time toward providing a series of new peripheral devices and systems for remote data transmission to include, e.g., a communications processor capable of handling up to 352 lines (EC 8371), programmable terminals, systems for preparation of data, printers with improved quality of the printed image, color displays, disk memories with 200 Mbyte capacity and more, magnetic tape recorders with recording density of 246 bit/mm (EC 5027) and others.

The research program includes also the area of laser printers, large-capacity magnetic memories (more than 10^9 bit), improved display units, etc.

The first stage of JSEP 3 is based on the structural design of JSEP 2 hardware and operating systems, forming the framework within which are gradually developed elements with improved structural design and operating systems.

In this stage is also being developed the OS 7/EC operating system, provided with all JSEP 3 computers, whereby every user has at his disposal 16 Mbyte of (virtual) memory.

For JSEP 3 computers of the second stage is envisioned a multiprocessor structure based on problem- and functionally oriented processors. The problem-oriented processors include various processing processors, e.g., matrix, symbol and processors of problem-oriented languages providing effective translation. The functionally oriented processors include input/output processors, telecommunication and set processors (which optimize processing of sets on external memories). Individual processors are connected by a high-speed busbar.

Their structure is based on the main memory of large capacity (potentially up to 100 Mbyte) designed, e.g., on integrated circuits (potentially 64 Kbit and more). These specialized processors have their own memory (on the order of up to 256 Kbyte). External memory will be operated by an independent control processor and will serve as virtual memory. It will be physically constituted, e.g., by several 100 Mbyte units on cylindrical magnetic layers.

The transition to multiprocessor systems calls for new operating systems which will also provide for compatibility with existing operating systems.

The principles outlined above will make it possible to come up with systems with wide areas of application, adaptable to various fields of application.

New JSEP Computer

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 2, 1984 pp 197-202

[Article by Eng Josef Cmiral, Office Machines fiduciary concern organization, Prague: "EC 1027 Computer System"]

[Text] Introduction

The EC 1027 computer system is being introduced into production as of 1984. It can be used for dealing with tasks from the area of economic and statistical problems, for control of information systems, for mass data processing, for scientific and technical calculations. In addition to these already known and routine applications of computer systems, the EC 1027 computer system can be used for interactive processing of data in inquiry or dialogue mode of operation. The EC 1027 computer system is classified as JSEP, and its compatibility with other JSEP 3 systems and JSEP 2 members will facilitate the establishment of computer networks and hierarchical computer systems. The EC 1027 computer system is derived from the EC 1026 system and can use all the peripheral devices in the configuration of the EC 1026 system.

Models of computer systems produced as of 1985 can be designated as 1027-4, with the twin-processor complex designated as EC 1027-8.

Configuration of the EC 1027 Computer System

The EC 1027 computer system includes the EC 2127 basic unit and a set of peripheral systems, external memories and terminals. The configuration manual of the EC 1027 system lists the possibilities for connecting peripheral systems to the basic unit. The table already contains devices that are currently under development.

EC 2127 Basic Unit

The computer system's basic unit is of modular structure and is derived from the EC 1026 system's basic unit. It consists of an operational processor, an organizer, main memory of the service module and several transmission modules for the connection of peripheral equipment (see Figure 1). To the set of transmission modules can be connected a multiplex or 2-channel module, one or two disk modules and, further, one tape module and one communication module.

OP--Operational Processor (Operating Module OPM and CACHE Buffer Memory)

The basic role of OP is the processing of individual instructions and handling of interruption. If instructions are required by peripheral systems, it turns this function over to the corresponding transmission module (PM) of the basic unit for contact with those systems.

The buffer memory with a capacity of 8 Kbyte serves to accelerate the contact between OPM with the main memory (HP) during transmission of data and instructions.

The OP provides an operating speed of 400,000 op/sec in mix GIBSON III E.

ORG--Organizer

Its role is control of main memory operation and assignment of systemic busbars on the basis of priority accruing to the requirements of individual modules.

HP--Main Memory

Its total capacity is up to 2 MB with full plate set, 1 MB with half a set. It is based on elements MHB 4116 16K X 1 bit. HP is connected via ORG-HP (VOHP) and the ORG block to both the systemic busbar SSS and the special data busbar SHPD leading into OP.

The width of data flow is 8 bytes; data are protected by expanded Hamming code (1 protecting syllable per 8 data syllables), which facilitates correction of a simple error and detection of a double error. The main memory's response time is 500 ns. It is envisioned to start delivering computers with memory of up to 4 MB as of 1987.

Table 1. Configuration of EC 1027 Computer System

	(1) Označení		(2) Připojení řídicí jednotka nebo kanál
(3)	1. Vnější paměti		
(4)	- disk~~ové~~		
	EC 5061	(29 MB)	EC 5561
	EC 5066 - M	(100 MB)	DSK
	EC 5067 - 02	(2X100 MB)	DSK
	EC 5080; EC 5067	(200 MB)	DSK
	EC 5063	(317 MB)	EC 5563
	EC 5065	(635 MB)	EC 5563
	- ŘJ MD EC 5563		BL
	EC 5561		BL
(5)	- páskové EC 5004 (2 m/s, NRZI, FM)		PSK
(6)	EC 5026, EC 5027 (2 nebo 3 m/s, FM, GK)		EC 5527
	- ŘJ MP EC 5527		BL
(7)	- ~~disketové~~ EC 5075 (2X20X250 kB)		M
	EC 5074 (250 - 300 kB)		SRM
(8)	2. Lokální zařízení		
(9)	- klávesnice EC 0101 (abc - č)		SRM
(10)	- snímač štítků EC 6016 (1000 št/min)		M
	EC 6112 (300 št/min)		SRM
(11)	- výstup na mikrofiš EC 7602		M
(12)	- tiskárny EC 7039 (řetěz. 1200 ř/min)		M
(13)	EC 7045 (bodová sériová, 150 zn/s)		M
	EC 7230, EC 7231 (laser, 6000 ř/min)		M
	EC 7240 (elstat., 1000 ř/min)		M
(14)	EC 7934 - 02 (bodová sériová, 150 zn/s)		SRM
(15)	- děrná páska EC 7902 (in 1500 zn/s, out 100 zn/s)		M
(16)	- displeje abc - č EC 7920 - 01 (~~EC~~ 7922, EC 7927, EC 7934), EC 7910		M
(17)	- displeje grafické EC 7067, EC 7068, EC 7901, EC 7980		M
(18)	- grafické komplexy EC 7907, EC 7942, EC 7941, EC 7943		M
(19)	3. Vzdálená zařízení		
(16)	- displeje abc - č EC 7920 - 11 (EC 7921, EC 7927, EC 7934), EC 7920 - 21 (EC 7925, EC 7934)		TF
(20)	- sběr dat EC 8540		TF
	- terminál EC 8576		TF
(21)	- skupinový terminál EC 8534, EC 8542, EC 8577, EC 8579		TF
(22)	- dálnopis EC 8591, EC 8593		TG
(23)	- příprava dat EC 9053 (Consul 9114)		TF
(24)	- počítače JSEP (EC 1025, EC 1027)		TF
	SMEP (SM 4)		TF
	ADT 4500		TF
(25)	- inteligentní terminál IT 20		TF

Legend:

BL--block multiplex channel with DKM
M--MPX or any channel from DKM
TF--Telephone or direct connection
TG--Telegraph connection
SRM--Service module

The configuration manual will be updated as additional units become available for entry into Nomenclature and Plan for JSEP-3 Development.

[Key on following page]

Key:

1. Designation
2. Connection/control unit/or channel
3. External memories
4. Disk memories
5. Tape memories
6. Nebo = or
7. Diskette memories
8. Local systems
9. Keyboard
10. Punch card reader; st = card
11. Output to microfiche
12. Printers; r = lines
13. Dot series; zn = symbols
14. Dot series
15. Perforated tape
16. Displays
17. Graphic displays
18. Graphic complexes
19. Remote systems
20. Data acquisition
21. Group terminal
22. Teletype
23. Data preparation
24. Computers
25. Intelligent terminal

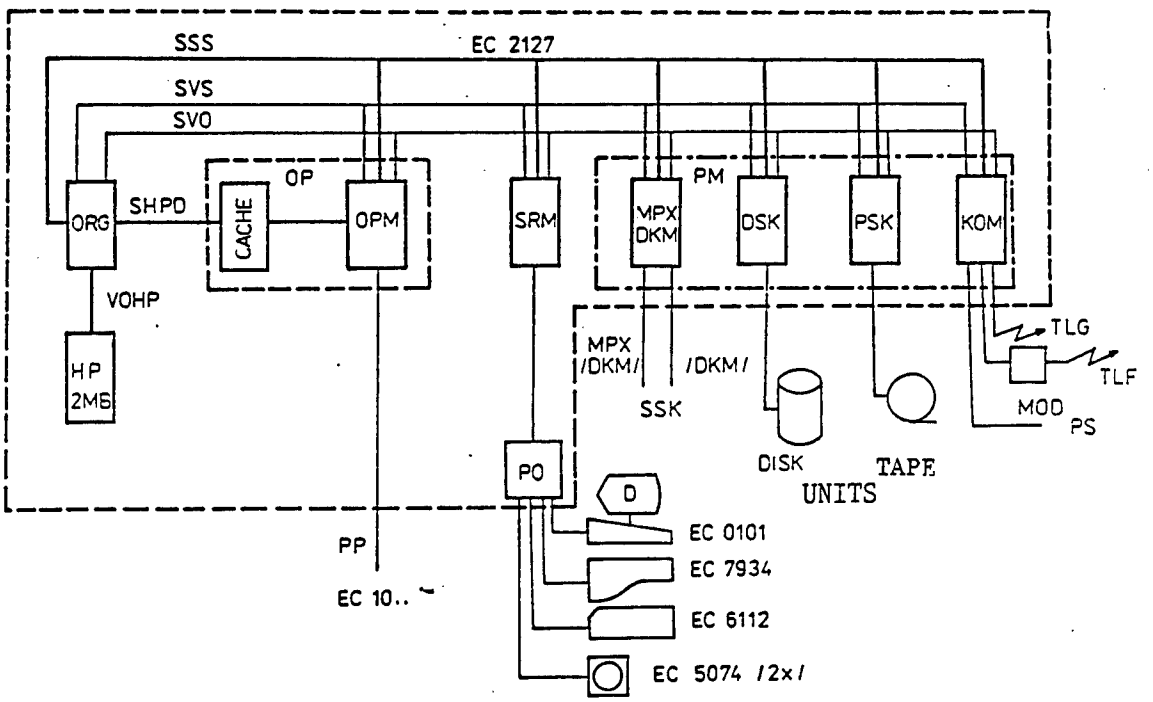


Figure 1. EC 1027 Computer System

Key:

OP--Operating processor
OPM--Operating module
PM--Transmission module
ORG--Organizer
HP--Main memory
SRM--Service module
MPX--Multiplex module
DKM--2-channel module
DSK--Disk module
PSK--Tape module
KOM--Communication module
PP--Direct access control (multiprocessor systems)
PO--Operator's control panel
D--Terminal of operator's control panel
MOD--Modem
TLG--Telegraph line
TLF--Telephone line
PS--Direct connection by cable (local)
SSS--Common systemic busbars
SVS--Independent service module control
SSK--Standard connection through channel
SVO--Independent organizer control
SHPD--Special data busbar
VOHP--Special data busbar

SRM--Service Module

This module provides not only for communication of the operator with the system, but also for control and diagnostics of all parts of the system. The following peripheral systems are connected to the service module via an external adapter and the operator's control panel (PO) with alphanumeric display (D):

--EC 0101 contactless keyboard,
--EC 7934-02 dot matrix printer,
--pair of EC 5074 floppy disks,
--EC 6112 desktop punch card reader.

Transmission Modules

All transmission modules (disk, tape, multiplex and communication) have an analogous structure and can be divided into the following parts:

--internal adapter, which provides for communication with other modules via a common systemic busbar (SSS);

--operating block, which provides for processing of information taken over from the internal and external adapter;

--external adapter, which provides for communication with units of external systems.

The operation of the internal adapter is identical with all transmission modules, and the operation of the operating block is analogous. These two basic parts are designed uniformly and they form for all modules the so-called transmission processor.

All modules are controlled by microprogram. Microprograms are stored in each module in the control memory of microprogram, which facilitates reading and entry. Microprograms are transferred into the control memory of each module from a floppy disk by means of SRM via systemic busbars.

MPX--Multiplex Module

The multiplex module performs in the computer system the functions of a syllable multiplex channel. With the aid of standard connections through channel (SSK) it can be connected all the way to control units of external systems.

DKM--2-Channel Module

This module expands the possibilities of the basic unit and provides for the operation of two channels: syllable multiplex and block multiplex. The 2-channel module substitutes the operation of a multiplex module. It is also possible to connect via the corresponding control units high-speed systems in block multiplex channel mode with transmission speeds of up to 1.5 MB/s.

DSK--Disk Module

The function of the disk module is to provide for direct connection of up to eight spindles of large-capacity disks 200 MB and 100 MB to the computer's basic unit.

Preparations are being made for the connection of a second disk module facilitating the connection of additional eight spindles of large-capacity disks 200 MB and 100 MB. The disk module combines in its operation the functions of a selector or block multiplex channel with high transmission speed and the functions of the control unit for disk units.

PSK--Tape Module

The tape module performs the function of control unit for tape memories, up to six of which can be connected, and simultaneously the function of a channel for this control unit.

KOM--Communication Module

This facilitates the connection of subscriber data transmission stations or computers via the telephone network, telegraph network or directly. The maximum number of lines is 16 telephone or direct lines or 32 telegraph lines.

Systems for remote data processing which use the telephone network are connected to the KOM communication module via the relevant devices for conversion of signals (modems). Teletypes are connected to the communication module through telegraphic signal converters, which form a part of the communication module. KOM can handle simultaneously 16 telephone (or direct) lines; each telephone line can be replaced by two telegraph lines.

As part of the supplementary equipment, it will be possible to provide the systems with a channel-to-channel adapter, which facilitates the local connection of two EC 1027 computers into a twin-computer complex.

Software

The DOS 3/EC operating system will be replaced in EC 1027 computer systems by the DOS 4/EC system. This does not involve a new system, but an updated or supplemented version of the DOS 3/EC system. The development of the DOS 4/EC follows two paths: improvement of the system's existing components (improved reliability), and introduction of new components.

Considerable expansion in the system was undergone by the text editor LUISA, which already represents a relatively general-purpose and flexible means not only for the actual correction of texts and programs, but also for data acquisition and for simple inquiry applications. In the area of programming languages, the DOS 4/EC contains a new optimizing translator from the PL/1 language, fully compatible with OS 6, an improved version of FORTRAN and PASCAL translators. In RPG II and COBOL provisions were made for operation

with telecommunication systems. Means for operation with data bases have also been considerably expanded in the DOS 4/EC. In addition to the DL/1 (DBS-25), the IDMS data base system is also available. A new component of the DOS 4/EC system is the IQF interactive inquiry system, operating with both the DBS-25 and conventional DOS 4/EC data sets.

Last but not least, the potential for remote data processing was expanded by the BTAM basic access method.

Introduction to Computers

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Slovak No 2, 1984 p 202

[Review of book "Som (len) pocitac" [I am (just) a computer] by Eng Eduard Drobny and Eng Peter Drobny, Bratislava, Smena 1982, 230 pages]

[Text] In 11 easily understood chapters the authors familiarize the reader with the principles and operation of computers and the problems of computer technology in general as well as with the trends in continued development of computers and the cooperation of CEMA countries in the sphere of computer technology. A glossary of some of the terms used in the book concludes this topical book.

Video Literature

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Slovak No 2, 1984 p 202

[Text] In view of the ever increasing problems, shortages and prices of paper, some Japanese specialists predict that books of the future will not be printed on paper, but that their text will be recorded on tapes which the reader of the future will be able to replay on hypermodern video units. Several cassettes with recordings of poetry have already been published in Japan, but they did not meet with the response expected by the specialists.

USSR Open Computer Networks

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 2, 1984 p 202

[Abstract from AVTOMATIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, 1983]

[Text] The Institute for Electronics and Computer Technology of the Lithuanian Academy of Sciences in Riga resolved the problems attendant to open computer networks which provide access into the network for any given computer. The first network of this configuration is already operational in the Lithuanian SSR for the automation of scientific calculations and experiments conducted by facilities of the academy and other organizations. The network can be entered by computer systems JSEP, SMEP, Transdata 8152, Wang 2200 etc. The network also makes available data banks of the type POISK, KAMA and OKA.

Connected into this network are display keyboard terminals for active dialogue by means of the TISA interactive terminal system, which provides users with access to high-performance computers and use of various dialogue type program sets, e.g., DUVE and SEZAM. The technical establishment of this network systematically respected international X-25 CCIT recommendations.

Multicomputer Systems

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 2, 1984 pp 203-220

[Article by Eng Jaroslav Jandos, CSc: "Problems Attendant to Single and Multiple Computer Systems"]

[Excerpt] 2.1 Local Multicomputer Systems of General-Purpose Computers

In this part we shall deal with systems made up of general-purpose computers of generation 3.5 of JSEP 2.

The following hardware, shown in Figure 10, can be used in the establishment of the mentioned systems. This involves:

--direct connection of computers. This consists in connecting computers by a special parallel data busbar operated by instructions for direct recording (WRD) and direct reading (RDD). The sequence of data exchange between computers can be such that, e.g., computer 1 sends a WRD instruction, which positions on the special busbar 1 byte of information, while simultaneously activating external interruption (with the requisite identification code) in computer 2. The latter issues instruction RDD, which stores the data from the busbar in computer 2. Transmission of data between computers progresses by bytes, which makes this method unsuitable for the transmission of larger volumes of data. The maximum distance between processors connected in this manner is 60 m;

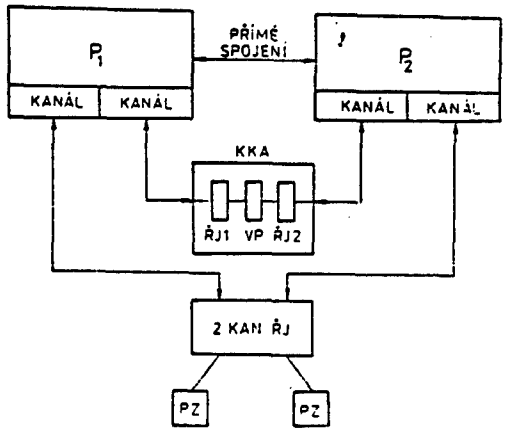


Figure 10

Key: KANAL = Channel PRIME SPOJENI = Direct connection

--channel-to-channel adapter (KKA). This serves to connect two channels of various computers. It is used for high-speed transmission of larger volumes of data. In the JSEP system are used adapters EC 4060, 4061 (USSR), which are structurally independent devices, or the EC 4065 adapter, which is structurally a part of the processor EC 2655 (GDR). The maximum transmission speed of this adapter is 1.65 mbytes/s during single-byte transmission and 3.30 mbytes/s during 2-byte transmission. The actual transmission speed is determined by the slower of the connected channels. The adapter can connect random types of channels. From the viewpoint of both computers it behaves as an auxiliary system controller equipped with a buffer memory (see Figure 10). Data transmission between computers is controlled by routine instructions for auxiliary systems. The maximum distance between connected processors is approximately 60 m;

--multichannel control unit. The twin-channel control unit for auxiliary systems can be connected to two channels of different computers simultaneously. The latter can then share, e.g., a common data base. Use is usually made of a control unit for disk memories, e.g., EC 5567 for connecting 100 Mbyte disk units EC 5067-02, or a control unit for magnetic tape memories EC 5517 for connecting of EC 5017-02 units. To prevent a state where computer 1 interrupts an ongoing operation of computer 2 with the shared system, the twin-channel controller is provided with "reservation of system" and "release of system" instructions, which serve for temporary and exclusive reservation of all connected units (in disk memories) or of individual units (in magnetic tape memories) for the needs of the given computer. The maximum length of cable for connection of a processor to a control unit is approximately 60 m;

--sharing the common part of main memory. This method is analogous to that used with microcomputers. It consists in the transfer of messages through the common sector of main memory, which is periodically checked by the corresponding programs of the connected computers. After storing information in this sector, it is possible to activate external interruption. However, this is not a standard method and no hardware or software provisions are made for it in the JSEP system.

The hardware listed above is supported by the OS/EC 6.1 operating system as follows:

--direct control--up to 256 bytes can be transmitted between two computers with the aid of the relevant macroinstructions;

--KKA--macroinstructions are provided for the transmission of a sequential set (access methods QSAM/BSAM);

--twin-channel control units--macroinstructions are provided for unit reservation.

With regard to computer structure, a specific problem is posed by the connection of two EC 1026 computers. This computer has neither standard channel nor control units for external memories. Thus, the connection must be performed by means of line adapter units, which are connected to the KOM communication modules of the connected computers (see Figure 11). The adapter

facilitates series transmission at a maximum speed of approximately 20 kbit/s. Thus, larger volumes of information can be transmitted in this manner. These computers can be connected over a maximum distance of 1 km. In addition, direct connection of the computers can also be performed (see above).

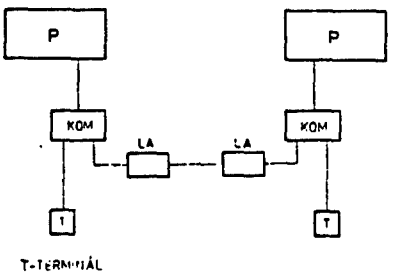


Figure 11

Structures of Local Systems

We shall deal subsequently with three basic structures of local systems:

Duplex System

This includes, as a rule, two computers. This arrangement (see Figure 12) is used when demands on the system's reliability are high. Computer P1 operates as an active computer into which is fed an input flux of data and from which exists an output flux. In case of this computer's breakdown, both input and output fluxes are switched over (symbolically represented by switchovers S1, S2; in practice, e.g., by circuitry or by operator) to the reserve computer P2. The latter must contain programs identical to those of computer P1 so that is can continue to run them, and must have either its own (regularly updated) data base coinciding with that of the active computer, or must have access (e.g., via twin-channel control units) to the data base of the active computer. Flux R serves for the transfer of control information between the computers. As long as computer 1 operates smoothly, computer 2 can be processing different programs.

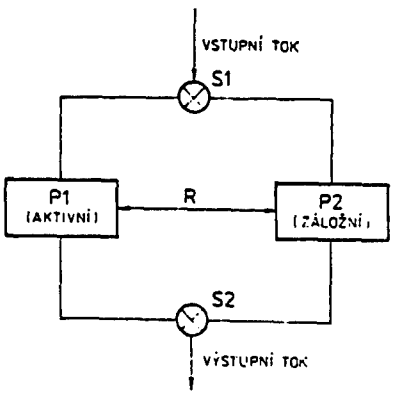


Figure 12

Key: Vstupni tok = Input flow
Vystupni tok = Output flow
Aktivni = Active
Zalozni = Reserve

Parallel System

This is used in cases where demands on the reliability of the system are even higher than in the preceding case. A parallel system with two computers is shown in Figure 13. Both computers operate in parallel, i.e., they simultaneously process an identical flow of input data. The output flows of both computers are symbolically compared in the CO circuit--in practice by circuitry (technically) or by program. If the results are identical for both computers, they represent the system's output flow. If they differ, there follows identification of the faulty computer. The output flow is then supplied by the faultless computer--after transmission of the requisite control information--through flux R. In principle, this method can be used for interconnecting even more computers. For example, three such interconnected computers were used for control of the manned flight to the moon.

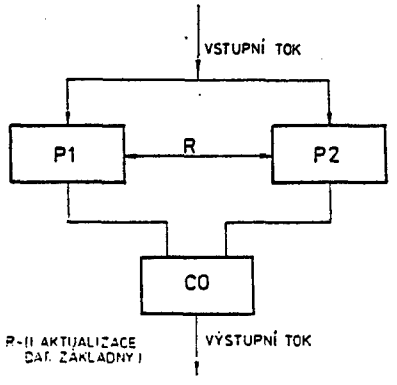


Figure 13

Key: Vstupni tok = Input flow
Vystupni tok = Output flow
R = Updating of data base

Master/Slave Computer System

One potential structure of this system appears in Figure 14.

The controlling computer (RP), which in this case is also the processing computer (main computer) handling primarily data processing, controls the subordinate computer (PP). The latter provides for, e.g., performance of extensive specific tasks, such as handling information input or a data bank (when it is referred to as back-end).

A specific example of a simple heterogeneous system is the local connection of SPU 800 with a JSEP computer (RP). The SPU 800 is used for data acquisition. It is connected to the JSEP computer (e.g., EC 1033) so that it simulates a perforated tape reader. Simulation on the SPU side is provided by a simulation program. The main (RP) computer then reads off from the SPU the collected data stored in external memory, e.g., the KPP 800 magnetic cassette.

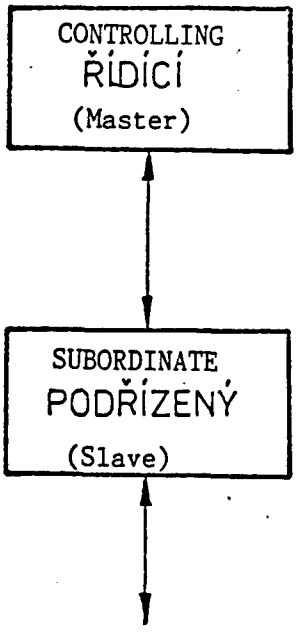


Figure 14

Another example of this system is shown in Figure 15. The system represents a multicomputer structure serviced by the ROS component in the OS/EC 6.1 operating system. This provides for effective batch processing of the relevant tasks on the system's processing computers. The RP provides system control, i.e., input and output of tasks for the entire system (even from remote terminals) and generation of a common set of tasks for the entire system, monitoring of PP, assignment of tasks to the latter and controlling their communication. The control computer selects for each task a suitable computer which is free and turns over to it the task to be performed only at the instant when that computer meets the conditions for handling the task (including peripheral systems). Assured performance of a given task by a certain moment is one of the selectable functions.

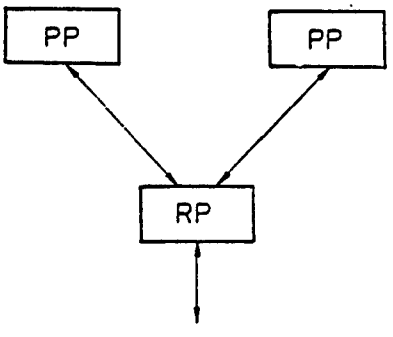


Figure 15

The PP's then operate as processing computers with their own peripheries and perform the tasks assigned to them by the RP. In the described manner it is

possible radially to connect to the RP up to seven PP's. The latter are connected via KKA. For each computer is generated its own operating system, which also contains the relevant ROS components (for RP and PP). In comparison with the use of individual computers, the ROS system approximately doubles the volume that can be handled by the system.

In addition to the structure shown in Figure 15, it is possible to use a variant of the ROS system with logic division of the RP into RP and PP, i.e., with logic modeling of both of the latter computers on a single physical computer. Such an RP can operate either with additional PP's or without them (with fictive KKA).

2.2 Local Multicomputer Systems of Mini- and Microcomputers

The following trends in the generation of multicomputer systems in the sphere of mini- and microcomputers have been coming to the fore over the past several years.

2.2.1 Multicomputer Systems Based on Microcomputers

These are formed by several microcomputers or personal computers with local connection, usually over a distance of up to 1 m. The purpose of the connection is to achieve higher output and share common resources.

A system based on SM 50/40 microcomputers can be included in this group. This system is based on an RP whose resources (systemic resources) are accessible to other PP's in the system; the latter, in addition to their own local resources which are not accessible to other computers in the system, have also access to shared systemic resources. The system is controlled by the MIKRON network operating system, which forms a link between the RP (operating under the MIKROM operating system with the relevant components of MIKRON) and PP (operating under the MIKROS operating system with the relevant MIKRON routines).

Mikrom reacts in real time to asynchronous requirements of the system (e.g., of PP) while Mikros--which facilitates only sequential processing--is not capable of reacting in real time. The topology in which the system operates can vary, e.g., radial, circular, busbar. The minimum RAM memory capacity of the 50/40 RP is 32 Kbyte, that of 50/40 PP is 16 Kbyte.

2.2.2 Local Networks (LAN--Local Area Network)

This involves local networks (formed by local links), most often homogeneous, which transmit information by in-series transmission along fixed (i.e., concommutated) private links--most often a coaxial cable--at high speed. The network is formed by links (see below) and stations connected to them. The latter are either computers (from this viewpoint the network represents a multicomputer system) or terminals.

These networks are included among multicomputer systems because, contrary to computer networks where the distance between individual stations of the network

is not limited, it is limited in the case of the former networks. The overall length of the link is similarly limited. The basic range of transmission speeds and distances covered by local networks--in relation to multiprocessor system--is shown in Figure 16.

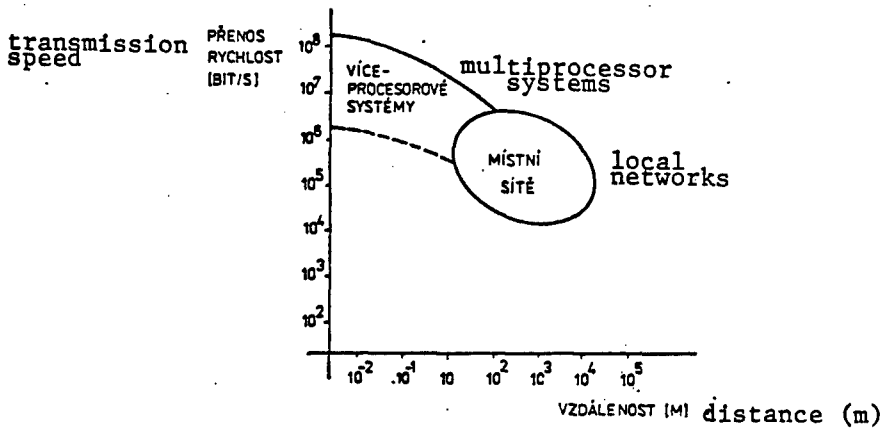


Figure 16.

In addition to high transmission speeds, the characteristic property of these networks is their orientation toward the problems of overall communication within an office, i.e., office application.

Soviet Dialogue, Dispatching System

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 2, 1984 p 229

[Text] The new Soviet dialogue and dispatching system uses JSEP 2 computers with the 4.1 version of the OC/EC operating system, which calls for working memory storage capacity of 200 KB. Its key mission is to improve the use of planning in servicing VCKP (Vychislitel'nye Centra Kollektivnogo Polzovaniya) computer centers. The new system uses the telephone network for providing dispatching services even for remote users. Among its key hardware components are sets for grouped control of EC 7906 alphanumeric displays, which consist of a display unit with an EC 7066 keyboard and the EC 7566 group control unit. It was developed by the Polytechnical Institute in Kiev.

Bulgarian Magnetic Tape Units

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 2, 1984 pp 237-240

[Text] Magnetic tape units as peripheral equipment for JSEP and SMEP systems are currently produced in many CEMA countries, Czechoslovakia among them. The Bulgarian People's Republic belongs through its wide assortment of types among the leading producers, these units being turned out by the OZZU Plant in Plovdiv. The basic specifications of these units are presented in an

outline in Table 1. From the viewpoint of CSSR users these units are in various stages of applicability, ranging from systems routinely supplied to the CSSR (e.g., SM 5300.01) to systems that are in final stages of development, such as the EC 5027.

Magnetic Tape Units for JSEP

This involves units with high transmission speeds corresponding to the recording density and speed of tape advance, which is 3 or 5 m/s. The following recording systems correspond to recording densities (the same as in SMEP units): 32 bit/mm--NRZI, 63 bit/mm--PE (Phase Entry), 246 bit/mm--GCR (Group Code Recording). All units use a single roller tape feed with vacuum catridges. Depending on the structural design of the tape feed, these units can be divided into two groups:

--units with vertical tape feed around the head. This includes units EC 5012-03 and 5612 with tape advance speed of 3 m/s;

--units with horizontal tape feed around the head. This includes the units EC 5003.03, 5003.05 and 5027. These units are characterized, among other features, by vacuum-tight adhesion of the tape to the driving roller, automatic tape lead-in, shorter rewind time, and substantially higher weight of the unit. The structural design promotes the units' improved operational properties with longer service life of some critical parts of the head (e.g., head with special coating). This design also formed the basis for the development of the EC 5027 unit, with top recording density and transmission speed.

Magnetic Tape Units for SMEP

These units, in comparison with those for JSEP, have a slower tape advance and, consequently, lower transmission speed, but their dimensions are substantially smaller with lower weight and price. The units are produced in a wide range of tape advance speeds from 0.3 (12.5 ips), 0.6 (25 ips), 1.14 (45 ips) and 2 m/s (75 ips). Depending on the structural arrangement of tape reels (and the relevant feed of tape around the head), these units can be divided into two groups:

--units with horizontal reel position. These units are smaller in dimensions and weight than units of the second group, but operate only with tape reels of maximum 216 mm diameter. This involves in principle units with lower tape advance speeds. This group includes units SM 5300.01, 5304C and 5308;

--units with vertical reel positioning. These units operate, similarly to those for JSEP, even with "large tape reels" with maximum diameter of 267 mm.

The table clearly shows how they differ from the preceding SMEP group. This group includes units SM 5302, 5303, 5306, 5309.

With the exception of the SM 5306, all units operate with a single roller tape drive with mechanical stabilization arms. The SM 5306 unit operates with

Table 1. Basic Specifications of BLR Magnetic Tape Units

(1) Typ	EC 5003.03	EC 5003.05	EC 5027	EC 5612	EC 5012.03	CM 5300.01	CM 5302	CM 5303	CM 5304C	CM 5306	CM 5308	CM 5309
(2) Počet zázn. stop	9	9	9	9	9	9	9	9	9	9	9	9
(3) Rychlost posuvu pásky (m/s)	3	5	3	3	3	0,3175	0,635	1,14	0,3175	2	0,635	1,14
(4) Záznamová hustota												
32 bitů/mm	+	+		+	+	+	+	+	+	+	+	+
63 bitů/mm	+	+	+	+					+	+	+	+
246 bitů/mm			+									
(5) Max. přenos. rychlost (kB/s) při												
32 bitů/mm	96	160		96	96	10	20	36	10	64	20	36
63 bitů/mm	189	315	189	189					20	128	40	72
246 bitů/mm			733									
(6) Doba start—stop (ms)	≤3	2	≤1,5	3	3	30	15	8,3	30	4,5	15	8,3
(7) Doba převinutí pásky (s)	<60	<60	<60	<120	<120	<300	<300	<250	<250	<150	<200	<250
(8) Mechanika posuvu pásky	1)	1)	1)	1)	1)	2)	2)	2)	2)	1)	2)	2)
(9) Aut. zakládání	+	+	+	—	—	—	—	—	—	—	—	—
(10) Max. průměr kotouče (mm)	267	267	267	237	267	216	267	267	216	267	216	267
(11) Rozměry (mm)	1750×800×800	1750×800×800	1750×800×600	1630×700×925	1630×700×925	310×482×325	621×482×530	621×482×530	310×482×325	621×482×600	310×482×325	621×482×530
(12) Hmotnost (kg)	450	450	420	295	295	30	60	60	30	90	30	65

Tape feed: 1) Single roller with vacuum cartridge
2) Single roller with mechanical arms

Key:

1. Type
2. Number of recording tracks
3. Speed of tape feed
4. Recording density (bitu=bits)
5. Max. transmission speed
6. Start-stop time
7. Tape rewind time
8. Tape feed mechanism
9. Automatic lead-in
10. Max. reel diameter
11. Dimensions
12. Weight

a vacuum cartridge and achieves transmission speeds similar to those of JSEP units, whereby it is substantially smaller in dimensions and weight. It represents a viable type of unit for SMEP with potential for continued development.

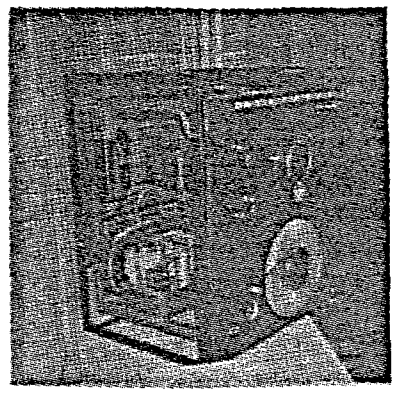


Figure 1. CM 5302 magnetic tape unit

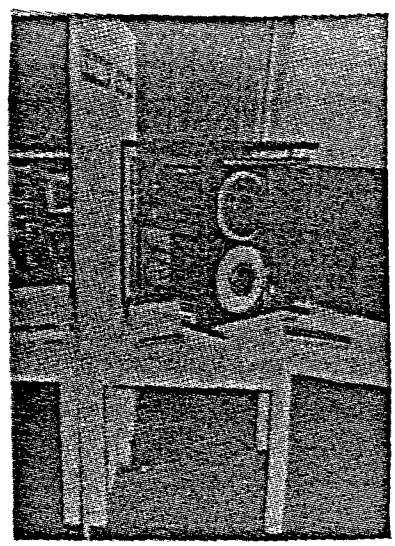


Figure 2. CM 5306 magnetic tape unit

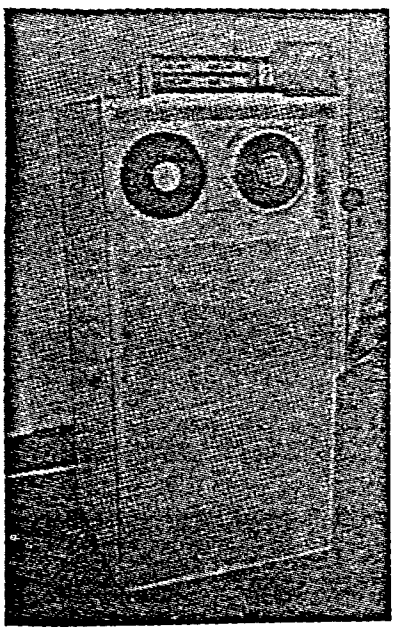


Figure 3. EC 5027 magnetic tape unit

Figure 4. EC 9070 off-line printer

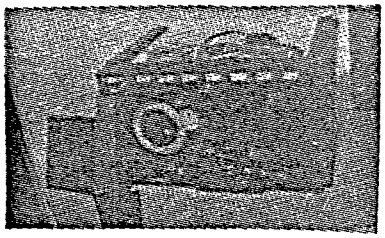


Figure 5. CM 5404C magnetic tape unit

All the units listed above were exhibited at the exposition of the Bulgarian Isotimpex foreign trade enterprise on 12-17 December 1983 in Prague. Presentation of lectures formed part of the exposition.

In addition to magnetic tape units, the exhibits included some other computer technology systems, such as:

--the EC 9070 system for off-line printing of information from magnetic tape. The system uses the magnetic tape mechanism of the type 5302 into which is inserted a tape with information intended for printing. With recording density of 32 bit/mm it is possible, under the current state of recording on tape (blocking, etc.), to store approximately 36,000 lines on one tape reel. Depending on the type of the connected JSEP printer, maximum printing speed is 1,500 lines/min.

Other developmental efforts will lead to increasing the volume of information stored on magnetic tape (730 m) up to 120,000 lines.

--system for the preparation of data on magnetic media. The exhibit showed the EC 9004 single-keyboard systems for the preparation of data on magnetic tape and EC 9114 for the preparation of data on floppy disks.

--the Isot 03260 computer control system for industrial applications based on the CAMAC standard. A part of this system was also the Isot 0230 daisy-wheel printer for printout of information in Russian or Latin script at a speed of 30 symbols per second.

Robotron Software Seminar

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 2, 1984 pp 249-250

[Text] As in preceding years, this year the Robotron combine staged in cooperation with the "Made in" agency and the Office Machines fiduciary concern organization a seminar oriented toward the problems of software for Robotron computers in general and for the EC 1055 in particular. This essentially internal seminar for personnel of NOTO [National Technical Servicing Organization] took place on 6-7 December 1983 in Prague. The introductory lecture offered basic information about the continued development of the OS/EC operating system as well as about the OS/EC 6.1. M9 operating system, which is to

become available in the current year, and about the OS 7 operating system, which is to become available as early as 1985. Other lectures were oriented toward methods of access in OS/EC remote data transmission. Attention was focused primarily on the TCAM/NF [Network Functions] access method, which is an expansion of the TCAM method. Its basic operation and functions correspond to TCAM, with new functions added. The basic expansion consists in cooperation of the method with the DPD type EC 837x programmable control units. The layout of a JSEP remote data transmission network is based on three levels of systems, i.e., computer, DPD programmable control unit and terminal control unit (group or independent). The TCAM/NF access method stored in the computer cooperates with the NCP control program located in the 837x control unit. The latter performs a number of functions that used to be realized by the TCAM method in the computer which controls the terminals connected to this control unit. NCP does not constitute a part of OS/EC. It must be purchased with the DPD control unit and generated in keeping with OS/EC and TCAM/NF. The latter supports systems operating in the start/stop and BSC modes, but also systems operating in accordance with SNA.

Macroinstructions analogous to those of TCAM serve for defining buffer memories, waiting lines, defining of systemic resources. New macroinstructions serve for, e.g., defining of systems connected to the EC 837x control unit (for NCP needs). Message flow through control program is analogous in both TCAM/NF and TCAM.

The next lecture was oriented toward continued development of the TSO component under both MVT and SVS. It dealt with individual stored sets and further TSO expansion consisting in follow-up on NCP.

Problems attendant to the interconnection of several EC 1040 and/or 1055 computers formed the topic of another lecture. It specified the hardware for such interconnections and offered basic information about program control of such interconnections (see also VYBER No 5/1983). It offered a basic explanation of the ROS system, which is a control system for improving the efficiency of batch processing in multicomputer systems.

The next lecture was oriented toward the problems of effective organization of computer centers. It pointed out organizational and systemic approaches leading to improved effectiveness of a computer center's operations. The last lecture described the Thesys systems for increased productivity in the generation of software. It offered a detailed description of the means promoting the compilation, implementation and tuning of programs.

The entire progress of the seminar and its attendance confirmed that it contributed to the dissemination of new information about Robotron systems and, consequently, their better utilization.

New Bulgarian Zvezda Software

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 2, 1984 p 252

[Text] The new Zvezda software system is being generated in Bulgaria for remote data transmission between SM-4 minicomputers and SM-1800 microcomputers in the joint Soviet/Bulgarian research and design institute INTERPROGRAMM. Transmission networks can be of the radial, busbar and circuit type.

New Soviet Operating System

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 2, 1984 p 252

[Text] The new Soviet OS RV operating system was devised for SM-4 and SM-4 minicomputers and for the Elektronika-60 microcomputers and the prospective SM-1420. The OS RV system is also suited for computer service centers in which the Elektronika-60 microcomputer will be the central computer.

Soviet Real Time Operating Systems

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 2, 1984 p 252

[Text] The Soviet approach to devising operating systems for operation in real time is directed toward problem-oriented microcomputer systems, e.g., the SM-300, Elektronika-NC and Elektronika-60. Attention is currently focused on the automation of information processing for fish harvesting in real time. Primary information is obtained from hydroacoustic sensors, navigational and other systems. These problems represent a divided computation structure, and the objective is to achieve in analyzed sets a graphic or digital representation of the concentration and numbers of fishes in a certain area of the ocean in real time. This resultant information is immediately used in fishing.

Coordination of Software in USSR

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 2, 1984 p 253

[Excerpt] Providing software for computer systems in the Soviet Union is under nationwide control and coordination from the viewpoint of classification and coding. To this end is published the monthly periodical KLASSIFIKATORY I DOKUMENTY. For example, in No 8/83 the following article appeared: "Problems of Planning OASR [Sectoral Automated System of Management] in Forestry With the Use of a Data Bank"; "Method for Binary Coding in Classification Systems of Hierarchical Entities"; "Use of General Classifiers in Compilation of OASR Plans in the 'Neftekhimprom' Sector"; "Preparation of Program Control Specialists Who Must Use ESKK [yedinnaya sistema klassifikatsii i kodirovaniya tekhniko-ekonomicheskoy informatsii = uniform method for classification and

coding of technoeconomic information]"; "Selected Methodologies Used in Sectors and Republics for Unification of Documents Used in ASR [automated systems of management]."

CEMA Office Systems Exposition

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 2, 1984 pp 278-281

[Article by Josip Rajman: "Fifteenth INTERBIRO Exposition"]

[Text] The largest exposition of information and office systems in southeastern Europe took place in Sarajevo in 1983 under the strong influence of the approaching 14th Winter Olympic Games that were being readied for February 1984. Twenty foreign and Yugoslav enterprises cooperated on their electronic equipment, which is far superior to that of Lake Placid of 1980, particularly with regard to a much more sophisticated recording of real time, both for local use and for television. Almost 30 companies participated in Interbiro, headed by IBM. The Winter Olympic Games were under the aegis of those companies. Rank Xerox even developed a "live wolf cub," the Olympic Games Mascot. The cub toured the entire premises of the exposition and participated in all sports events in Zagreb that took place that week.

Interbiro, which is also a member of the "UFI" International Fairs Union headquartered in Paris, emphasizes mainly the results obtained through Yugoslav coproduction with foreign companies--from East to West. More than 70 foreign and 90 Yugoslav companies met at the exposition. Most foreign companies exhibited their latest products known from the SICOB or Hannover fairs. Among the new companies should be mentioned American Athan and Megatek (Megatek's European headquarters is in Laysanne). These two companies market hardware. In the software field let us mention British Computervision, American Computer Associates and the Bulgarian ISSES company. Very much has been done for the development of software in Yugoslavia, not only for commerce and industry, but also for public services. Computers are finding increasingly wider application in production, and the use of robots is barely entering its initial stage.

Let us point out just a few of the most interesting exhibits.

Banex, Zagreb (which is also a representative for the minicomputer system Minicomputer Systems, Inc.) developed its own MD 83 videoterminal for asynchronous communication with a computer (11 to 19,200 Bauds). The screen with 1,920 symbols has programmed underlining (emphasis) and double light intensity. The offered options include synchronous connection to a computer, two-page memory (4 KB) and up and down moving of the image.

Birostroj, Maribor--sold over 3,000 computers in Yugoslavia.

Robotron model 1720 continues to be produced in Yugoslavia under the trademark RGB (Robotron-Gorenje-Birostroj) 101, as does production of three other

models from the Robotron A 1500 series under Yugoslav trademarks RGB 110, 120 and 130. Birostroj has also sold 240 terminals (terminal stations) 7920, mainly to IBM centers and for the FACOM system. Birostroj also took over representation of U.S. Gould (graphic systems).

Digitron, Buje--offered MAEL 5700 with 8 terminals and maximum 48 MB of disk memory. This system is being produced under license from the Italian company Corsoli, which is represented by Velebit, Zagreb. New products include: ASCII terminal for remote-controlled data transmission (110, 150 and 300 Bd) with tape perforator and reader, V-24 interface, a new control cash register which can also be incorporated into the system, new matrix printer 80 symbols/sec suitable also for graphic display, a new electronic teleprinter (ET 2080) based on the Zilog 80 microprocessor. An electronic scale for retail outlets has a new improved manually counted number of pieces per 100 grams or 1 kg of weight that can be stored in the scale's memory and, on the basis of the principle of analogy, it will indicate the approximate number of pieces in subsequent weighing. This scale (OPTIMA 2080 B) comes in three models (for 2.5, 5 and 10 kg).

Ekonomski Biro, Belgrade, is introducing a new product from German-Yugoslav coproduction. The Kienzie 9700 in its Yugoslav version bears the designation EMOK (derived from EMO, Ohrid in Macedonia and K from Kienzie). The first EMOK 9055, produced in joint production (with an improved operating system), is now being assembled in Yugoslavia.

Elektronskaja Indistrija (Ei), Nis--continues its production of Ei-Honeywell models DSP 6/48, 54, 62 and 96; line printers 9617 and 9618; two terminals (VIP 7300 and 7874); the W T/PRT 7005 teleprinter-terminal as well as tapes, disks and cassette units. Currently added is the Ei-Honeywell 6/10. The next step in Ei-Honeywell production should be the DPS 8. All other parts of Level 6 should also be produced in Nis. Ei is endeavoring to procure at least 50 percent of the value of parts from Yugoslav resources. Ei also produces two models of single-plate microcomputers (102 and 102A) type 4K RAM and 4 or 8K ROM/PROM, further micromemory modules of up to 16 KB RAM, I/O modules, converters, etc. All of the above are also marketed as OEM products.

A system for vending railroad or bus tickets is called ORIENT and is used by companies using hardware and software produced by Ei. In coproduction with Robotron it is producing S 6001 electronic typewriters, of which 2,000 were turned out last year. Ei will be supplying their electronic and Robotron their mechanical parts.

Elwro--Warsaw. In cooperation with the HCS producer in Munich, this Polish company is marketing MERA HCL 3008 office computers with or without a display screen, and the type HCS 3008 FD with floppy disks and magnetic strip cards.

Energodata, Belgrade has the latest EC 500 version with four terminals, sold also to banks and post offices.

IBM cooperates with several Yugoslav partners, particularly the university center in Zagreb, which devised the ISOS information system for the Olympic Games in Sarajevo. The hardware is formed by two independent IBM 4341/2 systems, 142 display screens, 89 dot matrix printers, 12 time signalization systems and 22 TERA-ZOI systems (developed in Yugoslavia).

In addition to peripheral equipment for System 1, some other electronic components for IBM are produced in Yugoslavia in coproduction with Yugoslav companies, particularly with Iskra, both domestic and foreign trade.

Iskra-Delta, Ljubljana. This organization was founded jointly by Elektrotehna and Iskra. It now has 750 employees, 200 of whom are engaged in research and development. It has 6 branches in Yugoslavia and established representation in 11 countries, including Switzerland (Perles A.G.). It now offers the PARTNER microcomputer (its original project) with a 128 KB central unit, 10 MB disk capacity and 1 MB floppy disk capacity. The system also uses the Yugoslav TRS printer (180 c/s). Term for delivery is 3 months, including standard financial software. Iskra-Delta also offers the DELTA 400 B system based on microprocessors (Z80 and 80A), which is compatible with all other DELTA systems, CDC, DEC and the IBM 3278 system. The central unit has 512 or 1024 KB of external memory, 50 MB on disks and 1 MB on a floppy disk.

The Yugoslav PAKA 200 printers (produced at Gorenje, T. Velenje) operate at a speed of 300 or 900 lines per minute. Iskra-Delta is among the leading Yugoslav software designers. Its assortment includes, e.g., software for the woodworking industry, poultry farms and the chemical industry.

ISSES, Sofia, stands for "Information Systems and Services of Systemic Engineering." It works for the Council for the Uniform System of Social Information, which is the largest institution for computer technology in Bulgaria, employing over 9,000 specialists in 28 regional computer centers. It is engaged in the generation of software, training and servicing. Their partners abroad are the Soviet Interprograma, IBM, Hewlett Packard, Videoton. ISSES offers a very wide assortment of software, particularly for industry. However, it also turns out its own hardware. The latter includes, e.g., two MICROFIN portable terminals which have up to 32 KB of EPROM and up to 32 KB of RAM memory.

Novkabel, Novi Sad. It cooperates with Videoton (Budapest) and produces ERA 20 and 60 systems. However, now it has one more new model, the ERA 60 A, with a central unit with 1 MB memory and 200 MB on CDC disks. A new product is a personal computer produced jointly with the University of Novi Sad with 64-256 KB memory, floppy disks and a printer.

Radioindustrija, Zagreb (RIZ) produces under license the Nixdorf RIZ 20 (= Nixdorf 8820) system. It works for 140 customers with 249 computers all over Yugoslavia. It offers specific software, e.g., for hospitals, exhibition fairs, printing plants, car repair shops, maintenance control, mail, etc. Among the most attractive exhibits at this fair was the Nixdorf POS 8812 (Point of Sale) system for 99 sales personnel, 635 groups of commodities, etc.

Rank Xerox has been operating in Yugoslavia for 17 years. From the total number of 9,000 copying machines in operation, 6,000 were delivered to Yugoslavia by the Rank Xerox company. The "wolf cub" ("vuchko" in Serbo-Croatian) as mascot of the Olympic Games will tour other countries as ambassador-at-large for Rank Xerox and the Olympics. The most promoted product in Zagreb was Series 10, particularly models suitable for duplicating and for copying computer configurations.

Robotron, Dresden, which has approximately 13,000 bookkeeping and billing machines (electromechanical and electronic) in Yugoslavia, exhibited in Zagreb its new A 5220 general-purpose system oriented toward the acquisition and processing of data. Most interesting among the Robotron OEM products was a compact light-touch keyboard requiring no more force than 1 Newton to operate.

The new K 8172 data transmission unit operates at a distance of 20 and 30 km. The most attractive of the applicational systems was NATALI, used for recordings during child birth, treatment, etc., for hospitalized patients.

Slovenijales-Kopa Dicision, Slovenj Gradec, produced the KOPA 2500 intelligent terminal with 64 to 256 KB based on microprocessors. External memory is on Winchester disks (10 MB) or on floppy disks with 1 MB capacity. Its periphery is formed by three passive terminals and a printer (180 characters per second).

Technicar, Zagreb, has already installed 180 office computers and is now demonstrating the 3-module TERA modem based on the Z 80 microprocessor. Its capacity is 64 KB and it operates with floppy disks, cassettes and magnetic tape. TERA 119 is a dot matrix printer (120 characters per second, 132 or 156 characters per line).

TRS (Tvornitsa racunskih stroyeva), Zagreb, demonstrated its TRS 828 conversion material which operates at 110-9,600 Bd, the TRS 838 asynchronous terminal, the 703 TRS floppy disk terminal, a dot matrix printer with memory for 192 symbols and the small TRS 702-102 electronic calculator with 56 KB, with spherical head (16 characters per second) and magnetic strip cards.

Unis, Sarajevo, offers in joint production with NCR, Olivetti and Olympia the NCR IMOS 9020 active multiprogramming system with 512 KB and 24 terminals. Joint production on the ETS 1010 system and the light LETTERA 35 portable typewriter was agreed upon with Olivetti for 1983, when 80,000 units were produced, and for 1984, when 150,000 units are to be turned out. The COPIA 1000 copying machine is also to be turned out in joint production.

The result of joint production with Olympia is an annual production of 300,000 TRAVELLER typewriters, of which only 20 percent are intended for the Yugoslav market. The rest is exported to the GDR and 130 other countries, e.g., United States, USSR, CSSR, China, Greece, Turkey, Egypt, etc.

Velebit, Zagreb, is a representative for a large number of companies and the initiator of many joint production agreements. It promotes the Polish EC 8371-01 system, which has up to 16 terminals for remote controlled data

transmission with 16 to 64 various links. It also demonstrates the Polish MERA 700 terminal system with 16 stations and the APPLE II produced in Yugoslavia.

Videoton, Budapest, demonstrated in Zagreb its SLK-80/MCD videosystem based on a microprocessor (Z 80 A or U 880) with 60 + 6 KB RAM, floppy and microdisks and the potential for connecting a great many peripheral units by means of four different interfaces.

Joint production of additional foreign products will be launched in Yugoslavia in 1984 as part of new agreements.

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SLOW PROGRESS IN APPLICATION OF SCIENCE

Bratislava PRAVDA in Slovak 6 Nov 84 p 3

[Article by Ludovit Kuniak, CSc, Bratislava: "All Focal Points Must Be Reinforced--In Search of Faster Application of R&D"]

[Excerpt] A well-based analysis of the causes of the slow application of science in technological development was published by Academician Yakov Mikhailovich Kolotyrkin (director of the Karpov Physicochemical Institute of the USSR State Committee for Chemistry, deputy academician-secretary of the USSR Academy of Sciences' Section for General and Technical Chemistry, chairman of the USSR Academy of Sciences' Council for Electrochemistry) in the Bulletin of the USSR Academy of Sciences 1984, No 4, which was also published in the CSSR (VESMIR 83 1984, No 8) under the title "How To Improve the Contribution of Scientific Potential."

I would like to return in my contribution to some of his ideas and add to them specific personal experiences, which confirm the validity of his conclusions under Czechoslovak conditions as well.

According to Academician Y. M. Kolotyrkin, "The greatest obstacle to increasing the contribution of scientific potential is the attitude shown by industry toward science and research findings. If things were to be called by their right name then it has to be said that very many industrial enterprises are turning their backs on science at the present time. However, this situation did not arise accidentally; it is due to the conditions under which our industry operates. If we want to introduce scientific findings into industry under these conditions, we cannot count on industrial enterprises to welcome us with open arms, but can rather anticipate their antipathy, a fact that applies not only to managerial personnel but to entire work teams, because becoming proficient in use of new findings will quite certainly hold them back in meeting the key indicators of the plan. The abnormal aspect of this situation is constuted by the fact that producers have become to orient themselves in their operations not toward the consumer, but toward the plan."

As Academician Y. M. Kolotyrkin points out further, this has brought about a situation in which institutes develop all kinds of efforts to interest industrial workers to verify and apply in practice the results of research, which should be the object of interest for the enterprise itself.

All this applies under our conditions as well. I know from personal experience how disgusted a scientist feels when he goes around offering his findings like a peddler to potential users. Understandably, many of them became discouraged by such a situation and after several unsuccessful attempts they resign. They take consolation in publishing the results of their efforts, have them patented or lecture about them, but they lack the persistence needed to achieve their application.

However, I would be less than objective if I were to assert that all the applications which I have managed to push through during my 30 years of research efforts all the way into production met with insurmountable obstacles. I came to understand that there were and are many objective obstacles in the system of planning, financing and organizing practical applications of science. If despite everything it became possible to introduce a good concept into practical social use, it was primarily to the credit of brave and inspired individuals in the production sphere, who many times fought for a socially beneficial concept even against administrative obstacles.

Thus, if scientific findings are to find faster application in social practice, there must be enacted rules that would force production enterprises to utilize them at a substantially accelerated rate. This would understandably create pressure on the scientific research base to come up with many more original stimuli promoting technological development.

Academician Kolotyrkin also takes a critical stance toward the contemporary cooperation of basic and applied research and science in industrial plants. Among other things he maintains, e.g., that central plant laboratories have ceased to be the staff promoting the technological development of industrial enterprises. Many of them reorganized themselves and became branches of sectoral institutes. However, the transfer of the most important functions of science from plants to sectoral institutes overtaxed these institutions by various partial tasks, their personnel being sent many times into plants to eliminate momentary bottlenecks. Under such conditions the sectoral institutes paid less attention to their own technological research. This, naturally, decreased their interest in the results of basic research and detrimentally affected the interaction between these two important links.

The above-mentioned opinions apply more or less under our conditions as well, particularly in the chemical industry, where I gathered most of my experience. However, appreciation is also due the fact that our political and state organs are aware of this situation and are actively seeking effective organizational forms that would link basic and applied research with production and effectively reinforce it. This leads to the establishment of scientific research associations within which the transfer of basic research findings into social practice would be faster, more effective and more general. Understandably, the proposed structures are just inevitable organizational forms that will not automatically bring about new factual contents.

As regards the remuneration of scientists for their efforts, Academician Kolotyrkin correctly sized up the unhealthy state of affairs that applies also to our country: remuneration at the present depends primarily on scientific

honors and titles, and an inadequate amount of attention is paid to actual results of work. That is why scientists endeavor primarily to prepare and defend their candidacy or doctoral theses, which are still pointed out as the key objective of research. Regrettably, many times their orientation is not toward the most difficult, but toward the most well-trodden paths of science.

Scientific and technological progress can be achieved only through harmonious collaboration in the science-research-development-production-utilization chain. It is a well-known fact that the strength of any chain is equal to the strength of its weakest link. It is not my contention that there is but one obviously weak focal point under our conditions. However, mutual accusations by personnel of individual links of the cycle from science to production are of no help here. Closest to the truth comes the statement that shortcomings and considerable unused resources in the application of science as the most progressive productive force exist in all links of the cycle of economic renewal. The best and most effective approach is then for each participant in this cycle to immediately set out to correct errors, starting with himself. After all, science in a socialist society can find more effective application in social practice only when and to the extent that all subjective and objective obstacles standing in the way of its application are removed.

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SCIENTIFIC FILM FESTIVAL IN CSSR

Prague RUDE PRAVO in Czech 26 Oct 84 p 2

[Interview with Milan Damits by Vladimir Smid: "Robotics and the Technical Film"]

> [Text] Every year the Techfilm Festival pays increased attention to one of the branches of development of science, technology and production. The key theme of this year's festival--Electronics, Automation and Robotics--drew experts from prominent institutions dealing with this subject matter to Pardubice. Among them was also engineer Milan Damits, CSc, scientific secretary of the Metal Industry Research Institute in Presov. We asked him the following questions:

[Question] Do you expect the Techfilm Festival 84 to help your work or the work of your research institute?

[Answer] Our institute is a research production unit in the field, consequently also an executive body of the state target program 07, that is, industrial robots and manipulators. This by itself obliges us to present our experiences at Techfilm, but also to gain information here which would complete our knowledge of the degree of development of our field in the world, and of its implementation at home.

Our institute performs research and development of industrial robots and manipulators, monitors, scanners and peripheral apparatus; it elaborates the methodology of creating automated technological workshops with robots and manipulators, designing such workshops and introducing them into production processes. Logically, it searches for the most effective ways to do so. That is why the Robotech Association was founded, to solve the above-mentioned problems. So far this association has gained 22 members, all of them either designing, research or production enterprises and organizations.

There is one sore spot in putting together these workshops, namely that single manufacturers have different requirements, so that a need arises operatively to develop and produce atypical equipment or parts. That is

why we orient ourselves toward a comprehensive solution, toward a balance of all components. This is made possible by the Robotech Association, and we are utilizing the technical gathering of this year's Techfilm to emphasize the mentioned need also.

[Question] Does this mean that your entering into close collaboration with other organizations in the field has not yet brought full effects?

[Answer] Our institute covers around 40 percent of Czechoslovak industry's requirements in this field. Therefore, our endeavor is to achieve the highest possible degree of cooperation among all enterprises which deal with robotics. This means that we prepare experts for special work places, we concentrate on progressive solutions of all related organizations both within the framework of the Robotech Association and beyond it, trying to present the solutions to others by means of information bulletins. This kind of cooperation has been in existence for 2 years now and, of course, not everything is ideal yet. There is potential in instructional video cassettes whose preparation is much more mobile and whose production is much faster than that of a conventional film.

I would like to add, however, that as for the idea of broad cooperation and experience exchange, there have been many good examples of its practical implementation.

[Question] You have mentioned the role of the technical film before. However, don't you think there is an evident need of bringing more conceptualization into this field?

[Answer] There is no doubt that technical film has a very wide scale of possibilities to influence the process of robotization directly. One sphere of subject matter is represented by robots and manipulators with their properties and capabilities. This is a very broad sphere, covering the introduction of industrial robots and manipulators into technological workshops and production systems.

It is also a very exacting sphere, since an automated production system with robots and manipulators consists of technological subsystems, interoperational manipulation, operational manipulation, resources and energy distribution, not to mention measuring, checking and control. Moreover, in order that the film crew would not have it too simple, every subsystem has its own function and technical means. To top it all, robotics cannot be described in the press, television, and particularly not in technical film as an independent field, but has to be considered as a component of a single whole, that is, automation.

Perhaps I can state that we ought to expect more from both the state film and the enterprise film creation, as far as a greater variety of technical subject matter and the ways of dealing with it are concerned. This year's Techfilm has given a fair start to this trend.

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BRIEFS

HEART TRANSPLANTS IN CSSR--Prague (CSTK [Czechoslovak Press Bureau])--A heart transplant program is successfully progressing in the CSSR at the Institute of Clinical and Experimental Medicine in Prague-Krc. Two additional transplants were performed in late October. Both patients, a 48-year-old secondary school teacher from Jihlava and a 42-year-old conductor from Prague 4, are now 2 weeks and 1 week, respectively, after the performed transplants, in satisfactory health and have been transferred from the intensive care unit to a normal ward. The first patient who underwent a successful heart transplant, performed in January of the current year, is in good health and has been working full-time since the end of August. [Text] [Bratislava PRAVDA in Slovak 6 Nov 84 p 2] 8204

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RESEARCH ON TRENDS IN MACHINE TOOL AUTOMATION

Dresden SAECHSISCHE ZEITUNG in German 14 Sep 84 supplement p 3

/Peter Kuehnrich interview with Prof Dr Detlef Kochan, Head, Department of Production Engineering, Production Engineering and Machine Tool Division, Dresden Technical University./

Our interlocutor, Prof Dr Detlef Kochan, was born on 28 June 1935 in Gera. From 1955 to 1961 he studied at the Dresden Technical College of that time, Department of Production Engineering. He received his A-degree in 1965 and his B-degree in 1971.

In 1975, the scientist was appointed full Professor. His special field at the present time is computer applications in production engineering.

Up to now, Prof Kochan has about 130 scientific publications, among them six books.

The Dresden scientist represented our country at the JFIP (International Federation for Information Processes) Technical Committee TC 5. From 1977 to 1983 he was Chairman of the Working Team 5.3 (Computer Supported Production Engineering) of this UNESCO Suborganization. He is a member of other international scientific committees.

Prof Kochan is married and has three children.

Question: The first tools represented, so to speak, extended and reinforced human limbs - a copy, if you like. Today, if one looks at pictures of fully automated factories, it becomes instantly clear that productive power creates completely new opportunities for science. Will technology become less and less "human-like"?

Prof Kochan: Yes and no at the same time! Yes, if you mean only the external shape, only the geometric form. This will resemble humans less and less. But apart from this, the question can be unambiguously answered no. The reason: we start from the idea - and this is the main task of engineers - that technology, the machine, will take over more and more human functions. NC technology has proven itself for twenty years and is also well established in our

Republic. It led to an external change of machine tools, which now no longer require primarily manual or mechanical operation, for instance by manually operated positioning levers or the like. The combination of mechanics/electronics devised such terms as "mechatronics". Human intelligence entered machine controls to a greater degree in the form of specialized software. A complete redesign of tools and processing machines, which previously were oriented towards the necessary human operation, is the consequence. To this extent, the "human similarity" is clearly increasing.Highly developed control systems, for example sensors, can take over functions such as observation and reaction during automatic production.

Question: Is technology thus becoming "more benign to the human person"?

Prof Kochan: Certainly! The human activities are becoming easier, cleaner, altogether more pleasant. Precisely in socialism there is a triumph of automation.

Question: Are factories without people still completely futuristic for us today, or are they "ringing in" a new trend for GDR machine construction?

Prof Kochan: Futuristic? No! Naturally, even in the year 2000 and beyond, highly automated factories will work with people. But significantly fewer people will be involved in the direct production process. For this reason, we are even now orienting ourselves towards the idea called "low-operation". By this we mean fewer employees in the first two shifts and no employees in the night shift. This trend has already now begun here. Machine construction in the GDR already uses such flexible production systems which extend far into the future. Complete workshop areas are thus highly automated. By including robot technology for automated transport and automated storage, already now the point is not merely to automate one production area but entire segments of the operation. Yes, as far as the entire business.

Question: Fewer and fewer people in the direct production process by progressive automation. But how about quite different areas, so to speak, the creative areas, for example design and engineering? Does automation stop there?

Prof Kochan: On the contrary. Here too it has already taken a firm foothold. For nearly twenty years, computer technology has been used productively for numerous calculational and decision problems in design and engineering. Consequently we must today view automation in a more comprehensive sense. Many such so-called "insular solutions" must be connected together to form all-round information solutions. Automation must thus extend from the work management right down to the production process.

Question: In this connection, the terminology CAD/CAM seems to appear here internationally more frequently. What does this mean?

Prof Kochan: Really precisely the point we just made - all-round information processing. The term CAD/CAM has also become customary here with us: computer-aided design /computer-aided manufacturing. The emphasis is on the slash which expresses the integration of these working areas.

Question: What is the main research contribution which your section makes toward automation and low-operation production?

Prof Kochan: We work jointly with industry in the context of higher education, precisely on such contributions towards all-round information processing. The activities of the section on the one hand are directed to contribute towards low-operation production, by further developing the highly automated processing stations - so-called production cells. These include computer-supported process monitoring, automatic workpiece change, and other matters. On the other hand, we are concerned with their mutual interactions.

Question: Is the computer now actually located centrally in a room or is it located directly in the machines?

Prof Kochan: By means of freely programmable computer controls, we have installed a considerable portion of the computer technology in the processing stations themselves. However, there also exists a central computer for overall coordination, for information managing from the central. The operation is thus process-coupled for the various processing stations. Naturally, to this must be added the entire external technical preparation.

Question: A very promising beginning for the fully automated factory?

Prof Kochan: This too we already have "on a small scale". By interdisciplinary collaboration, the section created an automated system with parts production, assembly, transport, and subsequent storage, central management, for teaching and research. "Autfert 14" - automatic production at section 14. But to come back to our research project: my working collective is working out such a CAD/CAM solution in the area of designing the production management and the production of rotationally symmetric parts - 50% of the parts spectrum. This is being done jointly by our section, which is concerned with foundations of machinery, and by our industrial partners. On the other hand we are working on problems of building geometrically complicated shapes, so-called doubly curved surfaces, which are of interest for car bodies, tool construction, the consumer goods industry, and others. In this connection too, we are working out such a solution that is much more effective than all previous variants.

Question: What do you consider the most important economic effect associated with such automation solutions and what is the order of magnitude of this effect?

Prof Kochan: The run-through time, starting from product design and extending to production, is greatly shortened. Down to one twentieth! In computer-supported designs, it is possible, for example, to calculate variants in minutes where an engineer otherwise would have to sit down to the job for weeks. Besides increasing the speed this also considerably increases the quality of the result.

Question: In production management, the computer is already taking over work that was previously assigned to the designer or engineer. Does this machine intelligence become a competitor that is likely to displace human creativity?

Prof Kochan: The computer or "intelligent machines" that are equipped with computers will always be able to decide only within the framework of variants prescribed by the human being. Consequently creative thinking will continue to be necessary. Even though the boundaries for the "intelligent machine" will be able to be drawn wider and wider. There is a nice saying here: the computer is fast, accurate, and stupid. Man is slow, inefficient, and brilliant. To combine the brilliance of the human person with the speed and accuracy of the machine - that is the great art.

Question: What research results - including those from "Autfert 14" for example - can we use in the near future for practical application?

Prof Kochan: "Autfert 14" yielded specific research results with a possible increase of work productivity to 300% in various practical examples. With the problem area you mentioned above, mainly CAD/CAM for doubly curved surfaces, we were the first to produce a technical solution at all. This is a preliminary accomplishment for practical application. In the meantime it is already being used, for example, in the shoe industry, in tool construction and sometimes in the glass industry. It is associated with considerable efficiency.

Question: One fact: in our society automation acts in the sense of social progress. Mass unemployment by the "job killer" microelectronics here is a foreign word. But how will automation in such a comprehensive style affect the activity profile of the worker and the engineer of tomorrow?

Prof Kochan: The activity of the worker will be characterized by his having to supplement the high flexibility emanating from the new production equipment by his own availability. This presupposes comprehensive education so as to be able to adapt to rapidly changing production conditions. In professional life, the turnover of knowledge will therefore proceed faster and faster. Thus, a worker must be able, for example, to understand graphic displays of processes which occur in the computer and which are exhibited on the video screen of a control. All these new requirements demand that he find a quite new relationship to microelectronics. Relative to the engineer, this means that traditional "working principles" in the form of sub-assembly and transmission elements, for instance in machine construction, will be replaced by completely new electronic principles, and this with nearly dizzying speed. Here too, an engineer must keep pace intellectually, and must be able to convert new information more rapidly than previously.

Question: Brought to its logical conclusion - don't classic pictures of the profession and scientific-technical structures begin to totter thereby?

Prof Kochan: Let me express an idea which may seem somewhat bold. Perhaps the classical separation of machine construction, electronics, electrical engineering should be seriously thought over. In a progressive production process, all the scientific disciplines and advanced insights will act together jointly. The scientific conception of the technical university specifically includes these problems.

Question: Isn't that a contradiction? Previously a separation in these branches was made because the relationships were becoming more and more complicated and because of the increasing scope of knowledge. Is a retrograde process possible today?

Prof. Kochan: No! Naturally, every scientist must stick to his own problem but must pursue for a long-term focal points in his work. But, all in all, the "system aspect", the complexity, is given more weight than previously.

Question: What insights from other scientific disciplines do you mainly use in your work?

Prof. Kochan: The manifold possibilities of control engineering - especially digital automation engineering - and the active inclusion of information processing technology at the most various levels, whether as a work station in man-machine dialogue, laboratory automation, or also in other cases.

Question: If you had a wish for the future, what "super machine" would you like to invent?

Prof. Kochan: A cybernetic machine or a cybernetic system which, first of all, works under remote control, and which thus liberates its operators from the dangerous areas, from dirt, vapors, oil, noise, etc. Secondly - and this is still posing problems at this time - the machine would also have to include the preparatory and completion activities within the automation solution. In the sense of rapid product changeover. Just consider that 80% of the production in our country is small scale and medium scale. The entire process of operations would have to be able to be managed by the "thinking" machine. This would have to be done externally, process-controlled, self-regulating, self-monitoring, and self-correcting. The extreme case of "my" machine: the engineer on duty, in his bedroom, casts his eye on the monitor, checks once again the most important components of the coming night-shift process, and from the video screen comes a calming "Goodnight"!

Question: We can only say "Goodbye", and we thank you very much for the interview.

Figure caption:
In the fully automated machine system "Prisma 2", in the machine tool combine "Fritz Heckert", prismatic work pieces, from the rough casting to the installation-ready component, are transported on air cushions from one station to the next. A computer center electronically controls all the working steps.

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STUDY STRESSES NEED FOR DEVELOPMENT OF SUBMICRON TECHNOLOGY

Budapest MUSZAKI ELET in Hungarian No 21, 11 Oct 84 supplement pp 1, 2, 6-9

[Article by the National Technical Development Committee (OMFB): "Tasks for the Development of the Domestic Precision Engineering Industry and of Submicron Technologies" based on OMFB study number 4-8301/a-T]

[Excerpts] One of the tasks of this study--certainly one of the most important tasks--is to formulate those short, medium and long range tasks which could reduce and possibly eliminate our backwardness in the areas of the precision engineering industry and submicron technologies. We considered it necessary to summarize for orientation purposes--those procedures, tools, equipment and materials which are the fundamental carriers of nanotechnology. This is the other goal of the study, which we considered important because thus far a summary work on this theme has not appeared in the Hungarian language.

We will not deal in the study with the specially microelectronic questions (LSI and VLSI manufacture and the tools for it) because these will be discussed by a parallel study being prepared (OMFB number 4-8301/b). The two studies together give a full cross section of nanotechnology and demonstrate the magnitude and determining significance of the task. In the course of working out a conception attention must be paid also to OMFB study number 16-8102-ET titled "Possibilities for the Spread of Use of Technologies Used in Microelectronics."

In addition to finishing with submicron precision, nanotechnology is characterized by ultraprecision assembly and use of materials with very precise properties. What is actually involved is that the precision engineering technology of the microelectronic age has been developed; it builds on the results of electronics thus far and is the pledge of further development. Submicron precision is needed primarily in the manufacture of microprocessors and manufacturing tools for microelectronics and in the production of electromechanical computer peripherals, laser technology, sensors, measurement systems, measurement instruments, machine tools and spcial machine elements. But today every product representing a higher technical level has one or two key elements which presume or demand precision of micrometer size or finer. Thus we can say that ultraprecision manufacture is a question of key importance in the scientific-technical revolution.

This new manufacturing culture has not yet developed in our industry. Indeed, in broad industrial circles they are not even aware of the procedures, equipment and tools with the aid of which ultraprecision manufacture can be realized. At the same time, it follows from the product structure of our industry that nanotechnology is of strategic importance also in our country, indeed it is increasingly so. It can be established on the one hand that one can discover as a cause in some form or to some degree behind all our backwardness of a technological character the inability of our industry in regard to ultraprecision manufacture. Industry is completely at the mercy of capitalist import not only in the area of microelectronic parts but also in the area of precision electromechanical and precision engineering parts, machine elements and subassemblies. At the same time, the development and high level cultivation of nanotechnology fits ideally the conditions of our economy, given that what is involved are techniques and technologies with low material, energy and live work requirements but requiring and embodying high level physical and intellectural work.

For the time being our backwardness is increasing, and with it our dependence on others, even if immediate measures are taken in the interest of preventing a further broadening of the technological gap. And we must act quickly, because the vital interests of our economy are involved. The plans of the microelectronic development program will not be realized and there will be no modern computer peripherals (disks, plotters, cassettes), precision bearings or machine tools without the adoption of submicron manufacture.

Adopting submicron manufacture means creating a manufacturing culture which does not yet exist in our industry. The new culture presumes a new attitude and a different incentive system and so the creation of it cannot be the task of individual enterprises. In addition to mobilizing enterprise resources, there is a need for central state coordination and material support as well. The expenditures will not be returned at the enterprise level in every case quickly enough for the enterprises to be suitably interested in mobilizing their resources.

Our recommendations have been put together in the hope that they will become the guidline after appropriate refinement.

The Domestic Status of Precision Engineering Technology and Submicron Finishing

On the basis of the traditions and present product structure of domestic industry the economic significance on the theme is obvious even without analysis; it is also obvious that our backwardness behind the developed industrial countries is significant. In the interest of a more detailed awareness of the situation and emphasizing what must be done the committee still felt it necessary to do an analysis of the manufacture of a few product groups.

The Method of the Situation Analysis

In order to survey the domestic situation expert case studies were prepared in the areas of manufacture of electrical measuring instruments, medical

technology tools, optical tools, machine tools, hydraulic equipment, sensors, electromechanical equipment, computer peripherals and precision machine elements (bearings). The purpose of the case studies was to discover, on the one hand, whether submicron technologies have or in the near future will have a role and significance in the given area in general, but especially in regard to domestic manufacture, and, on the other hand, to compare the domestic status of the special area with the leading countries and enterprises and to analyse the causes of the possible backwardness and the possibilities for overcoming it.

With regard to the novel nature of the theme we also made use of the aid of the OMIKK [National Technical Information Center and Library] to discover the most recent professional literature sources.

Key Questions of Domestic Development

On the basis of the expert case studies it turned out that the most important problems having a great effect on industry as a whole can be summarized as follows.

The General Situation

In harmony with international trneds the domestic branch case studies confirmed that the ratio of parts requiring a precision around a micrometer will increase significantly for a broad variety of products of the precision engineering industry (and for the machine industry in general).

The need for submicron technologies will not be general, but in some branches of industry a large part of the design solutions presume superprecision finishing.

Naturally the need for precision around a micrometer presumes new materials, new technologies, high precision finishing procedures which can be realized economically, and submicron precision manufacturing tools, measurement and quality control systems.

One can observe two interdependent trends in instruement manufacture--the vigorous spread of microelectronics and computer technology and miniaturization.

The use of semiconductor and microelectronic parts reduces the dimensions of devices and equipment, reduces the ratio of mechanical and precision engineering solutions with extensive live work and large-scale space and weight requirements and makes possible an increase in the level of automation and an increase in reliability.

Parts size decreasing with miniaturization requires proportionally smaller tolerances, that is greater precision. For other products and tools (machine tools, vehicles, aircraft, the space research industry, computer peripherals) the performance requirement is increasing in the absolute sense so that the increase in performance is accompanied by a reduction in weight and increased precision partly to save material and partly for functional dynamic reasons.

Special synthetics and alloys have a determining role; they must satisfy very strict prescriptions not only in regard to composition but also in regard to certain properties (mechanical, electrical, etc).

It can be established from the expert case studies that the average precision of parts is increasing in the domestic precision engineering industry; key parts must be made with submicron precision in more and more products. Another domestic characterisitc is that not only has nanotechnology not developed in the country, neither has precision engineering technology in the modern sense.

Without nanotechnology the manufacturing tools for microelectronics cannot be produced, not even to speak of key parts for machine tools, instruments, computer peripherals, etc. and without a modern precision engineering industry our industry will continue to be completely dependent on the developed capitalist countries. This dependence is well illustrated by those sub-assemblies, parts, machine elements and materials in regard to which we are forced to capitalist import simply because we cannot manufacture them in the desired quality.

Technologies

Indispensable for achieving submicron processing precision are the electronic measuring instruments the most important elements of which are printed circuit cards. The manufacturing technology for these embraces chemical and mechanical procedures. From the viewpoint of the precision requirements the drafting precision for the printed circuit cards is most characteristic.

The complex, highly integrated computerized systems used to design, check, assemble and test printed circuit cards are known by the name CADMAT (Computer Aided Design, Manufacture And Test). The domestic equivalent of the CADMAT system is the TGE (Designing, Manufacturing, Checking) system which provides domestic computerized support for procedures connected with printed circuits.

In the precision engineering solutions used in electronic measurement devices the use of thermoplastic technologies is of crucial significance; there is a need for domestic development of these, for the present domestic equipment does not have a way to keep temperature and pressure values automatically at the optimal level.

The development of surface treatment technologies for the mass manufacture of synthetic parts is of crucial importance (for example, use of synthetic parts is significant in the area of electromechanical peripherals, the injection molding procedures are known and the machines are available, but there is a lack of information in the area of aftertreatment).

It is a general problem in precision engineering design (especially for contacts and springs) that only a few domestic manufacturers have a galvanizing technology at a level which reliably guarantees galvanization of the same layer thickness.

The requirements are increasing in regard to chemical, vacuum vaporization and vaporization coatings also.

In the course of manufacture of sensors, in addition to mechanical processing up to micrometer precision, there is a need for special technologies (special metallurgical procedures, thin and thick layer techniques, high resolution photolithography, ion implantation techniques, electron beam and fine plasma beam welding, and mass spectrometer hermetically sealed control). Such nanotechnology procedures as laser, plasma or ion ray finishing or mechano-chemical, electrochemical or elastoemission finishing or, to use a new expression, atomic (molecular) processing in general, the common characteristic of which is that the unit of the volume of material removed is the atom (ion or molecule), are taking on special significance.

Machines, Equipment, Tools

Miniaturization and increased use of the most modern synthetics have a significant role in the development of the electromechanical fittings generally used in electronic equipment.

The domestic thermoplastic machines are of mediocre quality and are not suitable for manufacture of small size, high precision parts; the precision attainable is 100 micrometers.

In the interest of exploiting the possibilities in the new synthetics there is a need for modern machines for synthetic injection molding and pressing and for tools designed for these machines. With the aid of microprocessor controls these machines maintain at optimal values the most important parameters determining the quality of the processes taking place during injection molding, parameters which are regulated automatically by the controls on the basis of data measured by sensors built into the tools. In order to manufacture large numbers of parts the tools are multi-nested and they are made with high precision spark machining tools--to ensure the identical size of the nests.

Some of the metal working is cutting, which requires NC controlled cutting machines suitable for working small size parts; the control of these machines includes automatic tool wear correction too.

The Hungarian machine tool industry does not manufacture types where the goal would be a processing precision of 1 micrometer and less. But a few types could serve as a basis for achieving a processing precision around 1 micrometer. In certain size ranges domestic element assortments are available for ensuring such precision (rolling elements, rolling guides, ball spindles, control equipment). It is an open question in regard to, for example, problems of thermal stabilization, measurement systems, drives, etc, but these problems could be solved simply with developmental work or acquisition.

A machine tool really providing submicron precision is possible only by producing a new prototype, which would need modification of the controls,

stabilization of dynamic and kinetic conditions and a compensation solution. In regard to metal working machines a significant role will be played by precision cutting and special purpose automatic banding-upsetting machines in processing sheet but primarily in the case of contact manufacture.

A few precision cutting machines are in operation in our country already, but under the present cooperation interest relationships others, outside of the owners, cannot get much access to them.

But the domestic manufacture of precision cutting tools is not solved from the viewpoint of either manufacturing tools or primary material.

Electromechanical measuring transformers are important tools for ensuring submicron precision; the future elements of these will be strain measuring stamps. In addition to the traditional wire strain measuring stamps we must introduce in our homeland use of the foil stamps which can already be regarded as traditional in developed industrial countries.

Foil stamps of various configurations on the order of 100,000 will be needed for domestic manufacture.

In the interest of decreasing manufacturing costs and sizes there is also a need for further development in the area of thin layer and silicon sensors. Building such sensors into a common capsule with a microprocessor will make it possible to have smart sensors.

In order to calibrate the sensors it will be necessary to develop appropriate parameter setting equipment (verified pressure, temperature, etc).

The manufacture of electromechanical parts in Hungary is centralized at one place, Kontakta. To maintain the present level of manufacture taking place here and in the interest of further development serving the planned micro-electronics program it is absolutely necessary to obtain FRG and Swiss cutting, stamping, spark machining and special injuection molding machines, because the present machine park is obsolete.

A lack of precisely running, noiseless electric motors and stepping motors with a large number of steps and equipped with a tachogenerator is appearing generally in precision engineering equipment and instruments.

Domestic manufacture of miniature direct current motors with appropriate quality also represents a problem, since these are indispensable in computer peripherals, tape readers, etc.

In the area of electromechanical peripherals the necessary technology for manufacture of floppy disk stores is available, but tools, equipment and investment will be needed for the next step (Winchester disks). A backward-ness can be experienced in the area of disk technologies; we do not have the necessary precision cutting, extrusion and embossing machines.

Materials

The size of the moving masses frequently causes a problem in electronic instruments, especially in peripheral instruments. The use of injection molded synthetic parts, which has spread throughout the world, is advantageous from this viewpoint. A precondition for their use is primary material of appropriate quality, with which one can maintain great size precision, which is self-lubricating and which is not inclined to aging; parts made from this operate virtually without noise.

The swift growth in the industrial use of syntehtic parts due to the mentioned advantageous qualities applies not only to the instrument industry but exists in general.

The primary materials play a significant role in the quality of contact forms used in precision engineering equipment. Primary materials with little elasticity deviation are a precondition for manufacture of uniform pieces, and such materials are not manufactured in our homeland.

There is also a need for special corrosion resistant alloys in medical technology machines and precision engineering equipment, because the life expectancy of everyday corrosion resistant materials is bad and they show undesirable chafing and wear properties. Here also there are more and more synthetic elements, parts and fittings. Some of the necessary primary material is manufactured in CEMA countries but the most important materials can be obtained only from capitalist import. Independent of primary material manufacture, the CEMA countries cannot produce the most important semi-finished or finished products in the necessary quality, the chief reason being the undeveloped nature of manufacturing technology for synthetic tools and the lack of the necessary precision working procedures.

In regard to the materials of parts requiring precision manufacture in optical precision engineering devices also there is a wide variety; we find steels (including corrosion resistant materials and materials with a specific heat expansion), nonferrous metals (aluminum, bronzes), synthetics and ceramic materials.

The materials of electromechanical parts require precision metallurgical manufacture. In order to manufacture precise alloys with a guaranteed composition one must establish a small precision metallurgy plant.

In the area of precision machine elements, the cast iron disks needed for the manufacture of the balls of ball bearings now come from Swedish import; by improving the quality of domestic disks it would be possible to end a significant import burden. This would require creation of a small, special foundry. Among the other conditions necessary for ball manufacture one of the greatest achievements would be if the domestic material could be produced free of cracks.

Parts, Fittings

Electromechanical parts and fittings are of increased significance from the precision engineering viewpoint. In this area manufacturing specialized for

individiaul areas has spread throughout the world. Miniaturization (of connectors, switches, casings, electric motors, relays, etc) is an unambiguous aspiration in developments. The manufacturing background of parts and fittings demanding precision engineering is very much lacking in Hungary. The situation is made more difficult by the fact that the manufacturing technology for the parts involved requires capitalist manufacturing equipment, in addition to which the quality possibilities of them cannot be exploited with domestic primary materials.

Kontakta is not capable of satisfying domestic demand, thus the users try to carry out uneconomical, poor quality manufacture themselves or cover their needs from western sources.

The quality problems are greater when using electromechanical fittings developed by Kontakta.

At the same time, no one is manufacturing very many types of electromechanical fittings, although the demand is very great (IC casings, transistor casings, ribbon cable, connectors, indirect printed circuit connectors, pin contacts, etc).

The Hungarian electronics industry--as is the case throughout the world--bases its designs on printed circuit cards. Increased use of modern semiconductor devices is appearing in Hungarian products too, but with a delay of several years because of the domestic limited parts acquisition possibilities.

The situation is made more difficult by the fact that only capitalist manufacturers can produce some of the modern semiconductors; the economic policy consequences of international events make the possibilities of access to the newest microelectronic parts even more difficult. It follows from this that Hungarian electronic products contain specifically more precision engineering solutions than the products of the world leaders.

In the area of domestic development of high precision cutting machine tools, the most essential element for increasing precision is use of controlled gap bearings or slide ways (aerostatic, hydrostatic, magnetic).

In the area of optical precision engineering devices the characteristic parts requiring special processing precision are the pins, axles, roller bearings, flat bearing rings, control curves, torsion fibers and screw spindles. For these, in some cases, what is essential is not the size precision but rather form fidelity, surface fineness or ensuring the prescribed gap.

There is a general need for manufacture of high precision instrument industry, roller bearings and instrument industry screws.

Assembly

Because of the crowded structural layout in precision engineering parts, the striving for small dimensions and the high integration of electric parts the problems of precision assembly are coming into the foreground--assembly and

and welding procedures under a microscope, increasingly clean assembly and using synthetic parts according to the electric properties of their primary materials.

In Hungary only the TRT [Telephone Factory] has equipment at the world level for assembly of printed circuit cards (parts testing, sorting, adjustment, automatic seating).

There is a general need in the country for development of assembly technology in the area of precision engineering (manipulators, developing lines, automation, use of welding and soldering robots).

Measurement and Checking

New types of measuring devices are needed for measurement in size domains under a micrometer. For example, while the domestic manufacturing tools for printed circuit cards can be said to be at the world level and a number of manufacturers have them, checking the unassembled printed circuit cards is unsolved and this causes quality problems especially for the multi-layer cards. Automatic measuring devices do the measuring and checking after assembly, but only a few firms (the EMG [Electronic Measuring Instruments Factory], the TRT and the VT [Videoton] have them.

Sampling measurement and checking and automated mathematical-statistical evaluation of the measurements results are becoming general in mass manufacture.

There is a growing tendency to use multi-site measuring equipment and active measuring equipment. The spread of electronic, pneumatic, wave optics and hybrid instruments is characterstic of linear measurement techniques.

In addition to measurements of a geometric character there is a need to develop complex functional measurement and testing of assembly units and finished products.

It is necessary to acquire modern quality control equipment for the industry manufacturing precision machine elements.

In the machine tool industry a solution must be found for high resolution (0.1 micrometer) positioning and the checking of it. There is a need to introduce or develop laser measuring devices and holographic measurement systems.

Among the measurement technology devices which can be used in the 1.0 micrometer measurement range, we must develop and solve mass manufacture of a type similar to the Hottinger product using inductive feeler head displacement sensors.

Measuring instruments of an optical character may be considered primarily for in-process measurements. According to the surveys the future belongs to small semiconductor lasers unaffected by environmental conditions.

The sweeping beam He-Ne lasers just developed by the SZTAKI [Computer Technology and Automation Research Institute], the BME [Budapest Technical University] and the MIKI [Instrument Industry Research Institute] must be developed further, creating systems which can be attached to machines.

Environmental Conditions for Domestic Development

It appears clearly from a study of the domestic situation that development of precision engineering and submicron technologies is an extraordinarily complex task. The need for development is obvious, because vital interests of our economy are tied to it.

In the short term it is absolutely necessary to make up urgently for the most burning deficiencies, that is to adopt a few key technologies in the interest of manufacturing the outstandingly important machine elements and parts in the appropriate quality. A reconstruction of precision engineering technologies seems unavoidable in the middle term.

The development and implementation of a long term plan should correspond to our great national goals; as a result of such a plan our industry would become a shop for and exporter of precision engineering and submicron technologies.

Unfortunately the environmental conditions do not favor even the most modest plans. This appears from the present domestic situation of precision engineering and from the fact that not even the seeds of nanotechnology have developed in our industry.

What is lacking first of all is an attitude which attributes suitable significance to special quality, to ultraprecision manufacture. It is not yet recognized in the industry leadership or in technical circles that in tolerance ranges of a micrometer and finer the method of correcting, periodic adjustment and justification cannot take the place of size fidelity and especially of form fidelity. So there is a need to spread the information pertaining to the new technologies so that an appropriate attitude can develop.

Quality work is not rewarded. The contrary is more likely true; the most outstanding skilled workers and engineers migrate from the jobs embodying the domestic technological summit, where they earn less than elsewhere despite the strict quality requirements and the more tense technological discipline, the greater intensity and nervous concentration connected with this.

So the incentives which would encourage precision and even more so ultra-precision manufacture are lacking.

The unambiguous product centered nature of technical development, the lack of cooperation, the weakness of the background industry and the arrangement of the enterprises for vertical manufacture are not favorable from the viewpoint of technology--especially precision engineering and submicron processing. Under these conditions the significance of the manufacture of parts and machine elements embodying negligible values compared to the price of the complete product gets lost.

Increased linkage into the international division of labor is a precondition for the development of the machine industry--and creation of modern precision engineering. Cooperation with the leading capitalist firms is obviously in our interest, for basically the technologies being discussed constitute a monopoly of these firms. At the same time we must increasingly exploit the possibilities of socialist integration too, because cooperation with the capitalist firms will probably run into obstacles, because of the very high level of the technologies and because of a possible embargo.

The present investment policy also hinders development. It does not favor investments of a reconstruction character, rather it encourages the purchase of cheaper, traditional, mediocre quality equipment, which in turn preserves the technological backwardness. Ultraprecision manufacture, modern precision engineering, presumes an air conditioned environment with especially clean air, special work clothing, special washing equipment and materials and simultaneous acquisition of much expensive equipment (manufacturing machines, measurment tools, etc). Such environmental conditions have in large part an infrastructural character, and most often no money remains for these.

The problems connected with materials cannot be solved within the framework of domestic industry either, for in general what is involved is an extraordinarily large variety of materials with special properties and composition in relatively small quantities. It would be useful to select a small assortment of the materials and create the precision metallurgy, precision chemical industry and other conditions for them, so that we can buy the other necessary materials in exchange for them. Because of the importance of the problem there may be a need for an analysis of it within the framework of an OMFB study.

The new technologies must be included in the study plans of skilled worker training, technician training and higher technical education, for the use and development of them cannot be imagined without appropriate special training. Teaching the precision engineering designs, especially the design and manufacture of fine and precise moving and positioning devices, precision engineering technologies and ultraprecision measurement techniques and creating the technical background for the instruction are important conditions for catching up to the world level.

It appears obvious that the new manufacturing culture will develop in our industry only gradually. So it is necessary for the local capacities to be created to satisfy the needs of other enterprises too, and with the spread of information and by demonstrating methods it should have an effect on the development of the entire domestic machine industry. The development of an appropriate incentive system and interest is needed in the interest of this.

We cannot turn to every important environmental condition. It is perhaps clear from the problems listed that whereas precision engineering technology and submicron manufacture will develop at individual enterprises, creating the new culture for this and improving the environmental conditions cannot be simply an enterprise category. The complex task can be solved only within the framework of a well thought out, well coordinated, national, stressed action program and this will require not only enterprise resources but the mobilization of central assets as well.

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ACHIEVEMENTS OF UNITS OF NATIONAL CENTER FOR PHYSICS HAILED

National Center for Physics

Bucharest STIINTA SI TEHNICA in Romanian No 10, Oct 84 p 5

[Article by Dr Ioan Brandus, scientific secretary, Central Institute of Physics: "The National Center for Physics--Education, Research, Production"]

[Text] In the year in which we have celebrated the passage of 40 years since the antifascist and anti-imperialist revolution for social and national liberation, 10 years have also passed since the opening of the Bucharest National Center for Physics.

Together with the other branches of science, physics, organized within the Central Institute of Physics (ICEFIZ), has experienced a great upsurge, getting continual attention and support from the party and state leadership.

The period of the last 19 years, since Comrade Nicolae Ceausescu has been at the head of the Romanian Communist Party, has meant for physics a period of growing involvement in solving major problems of the national economy.

The main objectives that have confronted the physicists include the devising of technologies for nuclear power production and of nuclear technologies and techniques for applications of physics in the economy and the development of the physical sciences.

In proportion to the tasks, the material base of scientific research and technological engineering has been developed, specialists with a high level of professional training have been formed, and the cooperation with research and production units in all other fields has been developed.

The opening of the Bucharest National Center for Physics, on 22 October 1974, in the presence of Comrade Nicolae Ceausescu and Comrade Elena Ceausescu, constituted a special moment in the life and activity of the working people who work in the field of nuclear energy and physics. Turning into a reality the conception of our party's leadership with regard to integrating the activities of research, production and education, the center comprises five research units (the Institute for Nuclear Physics and Engineering (IFIN), the Institute for the Physics and Technology of Materials (IFTM), the Institute for the

Physics and Technology of Radiation Instruments (IFTAR), the Center for Astronomy and Space Sciences (CASS) and the Center for Earth Physics and Seismology), the Nuclear Apparatus Factory (FAN), the Faculty of Physics of the University of Bucharest, and Mathematics and Physics Secondary School No 4.

In addition, blocks of dwellings, dormitories for students, a boarding school for pupils and a commercial complex were built.

At the opening, Comrade Nicolae Ceausescu judged that "a true town of physicists, where researchers, professors, students and workers work, learn and live together, has been created at Magurele."

In the 10 years of activity at the National Center for Physics, the pledges made to the secretary general of the party have been fulfilled in an exemplary manner. A large number of apparatus, installations, techniques and technologies, materials and components, which have helped to introduce technical progress, to raise labor productivity, to improve product quality, to reduce the consumption of materials and energy and to reduce and avoid importation, have been achieved and offered to the national economy.

The following achievements stand out: the aluminizing of sheet glass, ionic nitriding, ionic plating, boriding with powder, processing with lasers, heat treatments with plasma, techniques of analysis through activation with nuclear radiation and through magnetic resonance, the production of materials with special physical and mechanical properties (like semiconductors and superconductors, piezoceramic, optoelectronic and magnetic materials and crystals), techniques of nondestructive control and of measurement with radiation, the production of new radioactive isotopes and of compounds labeled with isotopes. At the same time, the results obtained in the direction of studying thoroughly and expanding the scientific knowledge of physics regarding the structure and properties of the atomic nucleus, of the solid body, plasma and lasers and the physics of outer space stand out.

The prospect of the coming years brings new scientific and technical problems, more complex and more efficient in applications, which the researchers and technologists will surely solve, because, as the party leadership judges, there is no technical problem that Romanian specialists cannot solve.

Nuclear Physics

Bucharest STIINTA SI TEHNICA in Romanian No 10, Oct 84 pp 5-6

[Article by Dr G. Semenescu, Institute for Nuclear Physics and Engineering: "Nuclear Physics--the Thorough Study of the Structure of Matter and a Source of Nuclear Techniques"]

[Text] Although 2,000 years have passed since the concept of the atom was articulated in ancient Greece, the understanding of the properties and behavior of its constituents has still not been fully attained.

Much knowledge in this field, especially in the last 50 years, has permitted nuclear physics to have a very great impact on social life.

In our country, scientific research on atomic and nuclear physics began to be developed in an organized manner in 1956-1957, with the putting of a nuclear reactor and a cyclotron-type particle accelerator into operation. These two installations permitted important results to be obtained in the study of reaction mechanisms and nuclear structure; they are now used primarily for applied research for the purpose of solving technical and technological problems of the national economy (the obtaining of radioisotopes, activation analyses, the study of the deterioration of machine parts and so on).

In the last 15-20 years, the technical-material base of atomic physics has been developed rapidly as a result of the generous support from the party and state leadership and Comrade Nicolae Ceausescu personally. A modern tandem Van de Graaff-type particle accelerator, by means of which a new field of nuclear physics, heavy-ion physics, has been developed, has been put into operation. This year, the first experiments in heavy-ion physics were done, using a complex acceleration system formed of the tandem Van de Graaff accelerator as an injector and a postacceleration system. The latter is, in essence, a linear accelerator composed of 20 resonant cavities, by means of which an energy gain of 6 MeV of charge is obtained; thus, the energy obtained with the tandem accelerator is practically doubled, with the Coulomb barrier for symmetrical systems being passed.

The postacceleration system, achieved completely in the institute with the contribution of the Nuclear Apparatus Factory and other enterprises in the country, constitutes a success of physics in our country. Its achievement required the devising of complex techniques and technologies that would permit the obtaining of pressures in the range of 10^{-8} torr and the use of a computer to control the operation of the accelerator.

This modern material base is permitting the development of heavy-ion physics, a field in which new basic problems are posed with regard to the behavior of nuclear systems in extreme states, difficult if not impossible to obtain by means other than the interaction of heavy ions with the nucleus. The knowledge about nuclei in states of very high excitation energy and angular momentum and about nuclei far from the stability zone is being deepened and expanded. In addition, valuable information is being obtained about the mechanisms of interaction of heavy ions with the nucleus and the atom. All these things will permit us to penetrate more deeply into understanding the microscopic and submicroscopic world.

Along with basic research, applied research with a big impact on the introduction of technical progress has been developed. Starting from the interaction of heavy ions with matter, "nuclear" filters used to filter water (in microelectronics) have been achieved and methods have been devised and installations have been achieved for determining the concentration of metallic elements with a view to improving and automatically carrying out the flotation processes and for sorting uranium ore according to the concentration of metallic uranium.

Nucleonics Development

Bucharest STIINTA SI TEHNICA in Romanian No 10, Oct 84 pp 6-7

[Article by Dr D. Dorcioman and Dr G. Peteu, Institute for Nuclear Physics and Engineering: "Nucleonics in Support of Production and Life"]

[Text] In our country, the applications based on the use of nucleonics are experiencing wide development in practically all fields of the economy and social life--industry, agriculture, biology, medicine, research, education--as a natural result of the special characteristics of nucleonics, of which we mention: the wide applicability as an instrument of investigation, study and control; the perfect suitability for the devices for mechanizing and automating the technological processes; the great capacity for providing information, including by indirect means, under conditions in which other methods are not applicable; the low consumption of conventional energy; and participation in resources of unconventional energy.

The physical principles synthesized in natural radioactivity, the interaction of nuclear radiation with matter, and radioactive tracers are found at the basis of the applications of nucleonics.

With the help of sources of nuclear radiation, using the physical processes of transmission, attenuation, scattering, backscattering and excitation, it is possible to determine, measure and control--separately or in technological flows--a number of physical parameters, such as density, thickness, level, moisture, flow, calorific value, ash content, granulation and deterioration, encountered in practically all industrial fields (the chemical and petrochemical industries, the metallurgical industry, the mining industry, the consumer-goods industries and so on).

We will describe just one of these methods, connected with measuring the thickness of hot- and cold-rolled materials of various types and setting it to given tolerances, an irreplaceable method in all modern rolling mills. The principle of the method is given in Figure 1. A gamma-ray source of Co-60, Cs-137 or Am-241 or, if the rolled material is thin, such as paper, for example, a beta source of Tl-141 or Sr-90 is put on one side of the material and a radiation detector on the other side. The attenuation of the radiation depends on the thickness of the material being measured and on its composition. The detector picks up the changes in thickness (attenuation), which it transmits in the form of suitable dimensions to a microprocessor, which, depending on the tolerances imposed, controls the rolling process, rigorously maintaining the preselected thickness, displaying the deviations and presenting a readout of the rolling parameters obtained.

Within the Institute for Nuclear Physics and Engineering (IFIN), seven installations for the rolling mills at the Tirgoviste COS [expansion unknown] and one installation for the "Otelul Rosu" Enterprise have been achieved and installations for the rolling mills at the Galati CS [Iron and Steel Combine] are in the process of being achieved. It is enough for us to state that, working at negative tolerances, significant savings of metal and electric and

thermal power are obtained and, in addition, the quality of the rolled materials rises, making them competitive on the foreign market. The situation is similar also for rolling mills for paper, felt, glass and so on.

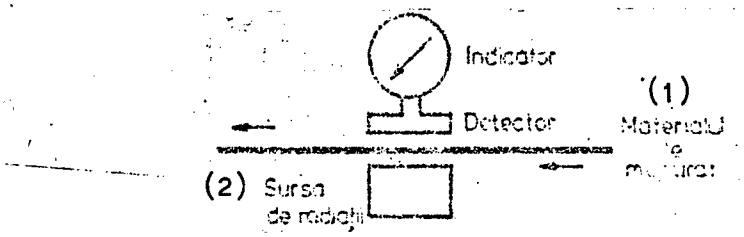

Figure 1. The Principle of Measuring the Thickness of a Material by Radiation Absorption

Key: 1. Material being measured 2. Radiation source

The use of nucleonics in medicine refers to a wide field of applications for diagnosis and medical treatment. Many radiopharmaceutical products used in vivo for scintigraphy on the main organs, such as, for example, pulmonary, hepatic, renal, thyroid, cerebral, spleen, pancreas and bone scintigraphy, are known.

Another technique, this time through radioimmunological investigations in vitro, obtains information on the state of health: direct analysis of certain substances in the body, such as steroids, endocrine secretions, hormones, blood or tissue proteins, nucleic acids, enzymes (triiodothyroxin), thyroxine), insulin, progesterone, testosterone, growth hormone, prolactin, hydrocortisone, prostaglandins, alphaphaetoprotein, gastrin and so on.

In addition, methods with radioactive tracers are used to determine blood volume and diseases, cardiac output, the capacity of the intestines and stomach for assimilation (digestion), fat metabolism and hemoglobin biosynthesis.

Radioactive Products

Bucharest STIINTA SI TEHNICA in Romanian No 10, Oct 84 p 7

[Article by Dr E. Gard, Institute for Nuclear Physics and Engineering: "Radioactive Products"]

[Text] The chemical elements and their combinations containing a radioactive isotope--natural or artificial--acquire a new characteristic through the properties associated with the emission of nuclear radiation by the respective radioactive isotope.

The utilization of the characteristic of a radioactive substance in practice has been developed in many directions, namely: the use of the changes in intensity of radiation in the interaction with the material medium penetrated;

the detection of radioactive emission as a means of investigating physical, chemical or biological processes; and the utilization of radiation emission as a form of unconventional energy.

The complex research regarding, on the one hand, the devising of the proper nucleonics, apparatus and equipment for various applications and, on the other hand, the devising of the technologies for preparing radioactive products has followed an upward course in our country, having as a basis means of obtaining radioactive raw material, nuclear reactors and particle accelerators.

In 1977, at the National Center for Physics there went into operation a modern unit for radioisotope research and production that paved the way for using with greater efficiency our own experience of over 25 years of activity in this field and created the conditions for meeting over 80 percent of the domestic need for radioactive products, with prospects of expanding the exportation of such products.

In accordance with the main directions in which the practical uses of radioactive products have been developed, the specialized research within the National Center for Physics has devised a rich assortment of radioactive technologies and products, which go in the following main groups:

Closed radiation sources. These are radioactive products in which the radioactive material in solid form (Co-60, Zn-65, Ag-110, Cd-109, Te-204 Am-241) is closed tightly in a capsule of aluminum, stainless steel, ceramic or other materials that ensure its integrity for the whole period of use. The closed radiation source is attached to a container for biological protection of the personnel who handle it and is part of an installation suited to the application for which it is intended: nondestructive gammagraphic control, determinations of physical parameters (density, thickness, moisture and so on) or technological parameters (levels in hard-to-reach installations), content analyses, irradiation for initiating chemical reactions, stimulation of seed germination, sterilization of medical instruments and so on.

Radiochemical products. These are encountered in many and varied applications in industry, biology and agriculture, such as, for example, control of the technological processes in the petroleum-extraction and mining-processing industry, in chemistry and petrochemistry, investigations in hydraulic engineering, agriculture and so on. The radioactive isotopes Na-24, Br-82, Cr-51, Zn-65, P-32, Ca-45 and S-75 are usually used.

Radiopharmaceuticals. These are chemical substances, including radioactively labeled medicines, that are administered to the human body for purposes of diagnosis or therapy, in conformity with the medical standards and the provisions in the Romanian pharmacopoeia. These products, achieved in various physical and chemical forms, include a varied range of assortments, namely compounds with I-34 , Tc-99m and other radionuclides for thyroid explorations and treatments, cardiovascular explorations and so on, labeled compounds and complexes, colloidal suspensions, macroaggregates and microaggregates containing the radionuclides I-125, I-131, Au-198 and Tc-99m for exploring the central nervous system and for bronchopulmonary, hepatobiliary and

digestive-tract explorations, radiochemical compounds and complexes containing Cr-51 and Fe-59 for dynamic hematological studies and explorations, and radiochemical compounds and complexes containing P-32, Tc-99m and so on for explorations of the bone system.

Standard radioactive sources and solutions. These include 37 radionuclides of the most usual kind, with measurement errors on a par with similar ones on an international level (1-4 percent, at a confidence level of 99 percent). They are used to check on the correct functioning, that is, to determine the effectiveness of measurement (calibration, graduation), of the apparatus and installations that evaluate the activity of radioactive preparations.

The standard solid sources turn up in the form of active material deposited on stainless-steel disks (alpha emitters), set on small aluminum trays (beta emitters) or placed tightly between two pieces of plastic in an aluminum mount (beta and gamma emitters). In addition, a group of eight radionuclides with a long half-life are included in a gamma-spectrometry set. The standard radioactive solutions are prepared in three ranges of specific activity between 0.0037-3.7 MBq/g.

The perfected methods of measurement and calibration of the standard sources and solutions produced in the IFIN are constantly collated on an international level.

Ionic Nitriding

Bucharest STIINTA SI TEHNICA in Romanian No 10, Oct 84 pp 7-8

[Article by Dr Phys P. Croitoru, Institute for the Physics and Technology of Radiation Instruments: "Ionic Nitriding: Installations and Technologies"]

[Text] The raising of the durability of parts made of steel or cast iron and, implicitly, of the competitiveness, that is, the reliability of the machines and installations into which they are incorporated, is now very acutely necessary on a world level, due particularly to the high price of raw materials, including energy. The increasing of the surface hardness of the finished parts through ionic nitriding, a peak technology in the process of generalization in the Socialist Republic of Romania, constitutes one solution.

Of the advantages that ionic nitriding has over the other nitriding procedures, we mention the better mechanical properties obtained in the surface layer, the total lack of toxicity and pollution, the low consumption of electric power and ammonia, and so on.

Nitriding represents, in general, a process of sorption of nitrogen in the parts being nitrided, the interstitial fixation of it (including through the replacement of carbon) and the formation of a solid solution. Nitrogen sorption entails the creation of a gradient of the surface concentration of nitrogen and the diffusion of it. In the case of ionic nitriding, the surface hardening is achieved by means of an abnormal electrical discharge, with the gradient of the surface concentration resulting both from the bombardment of

the surface of the parts (cathode) with ions and fast neutrons and through the backscattering of the cathode-sputtered particles in the form of FeN. The bombardment with ions and fast neutrons also leads to heating of the parts, necessary for initiating and speeding up the process of diffusion of nitrogen in the parts.

In the main, an ionic-nitriding installation consists of (see the diagram) a metal container R (the discharge anode), in which the parts being nitrided S (the charge--the discharge anode) are placed, a power rectifier Dv (the power variator), a control and measurement device Dc, an ammonia-dissociating device Dd (it forms the working gas), a vacuum group Gv, a temperature transducer T and a pressure transducer P.

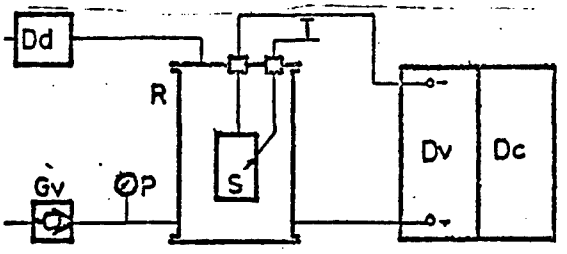

Figure 2. The Schematic of an Ionic-Nitriding Installation

At present, the following prototype dimensions of ionic-nitriding installations (INI) are being produced at ICEFIZ, in collaboration with the "Electrotehnica" Enterprise--INI-30 (30 kW), INI-70 and INI-150 (150 kW)--or are in the design stage (with the Bucharest IPA [Automation Design Institute] as a collaborator)--INI-300 and INI-450 (450 kW). Ionic-nitriding installations of 15 kW are being made at the Tirgu Mures "Metalotehnica" Enterprise.

Along with furnishing the installations, IFTAR also devises the ionic-nitriding technologies for the components of the customers in industry.

Installations, Technologies Under Vacuum

Bucharest STIINTA SI TEHNICA in Romanian No 10, Oct 84 p 8

[Article by Eng T. Pacurar, Institute for Nuclear Physics and Engineering: "Installations and Technologies Under a Vacuum"]

[Text] The exploration of the microcosmos by Romanian researchers has had vacuum technology as first-rate technical support. The vacuum equipment, initially imported into our country, has begun to be achieved, gradually, through our own forces, which has permitted, along with the equipping of the research laboratories, its delivery to the industrial units to begin.

As a result, in the research units of the National Center for Physics, the preparation of scientific-research and technological-development programs was

undertaken, there being set up for the 1981-1985 period the special program for vacuum technology, coordinated by the State Committee for Nuclear Energy. Its main objective involves the assimilation, within the units of the National Center for Physics, of vacuum equipment capable of meeting as many as possible of the requests in the economy for unconventional technologies in a vacuum.

The pressure range lying between 1 mb and 10^{-6} mb was chosen, a range needed for the majority of these technologies. Thus far, 75 prototype dimensions of products of vacuum technology have been assimilated, of which a few thousand have been delivered to the units in the economy.

One should note electron-beam welding, one of the most modern welding procedures, characterized by a very high power density (exceeded only by laser beams). The electron beam is generated by an electron gun having an acceleration voltage of 60 kV, within which a vacuum of 10^{-6} mb is achieved. Through an optoelectronic system, the beam is focused on the part being welded, placed in a technological chamber in which the vacuum is 10^{-4} mb. There the part will be moved at a suitable speed, so that the beam melts the material in the vicinity of the weld joint. In comparison with the conventional procedures, welding in a vacuum with an electron beam has definite advantages:

Welds of great depth and little width are obtained, the ratio between the width and the depth reaches 1 to 40, and the depth in steel, for example, can exceed 60 mm;

Materials with a high melting point, unweldable by other procedures, or materials different from one another (example: tungsten with copper) are welded;

The deformation of the parts after welding is extremely low;

The welding speed, which is high, reaches 15 m/min;

The zone of thermal influence is very small;

The welding is done without adding material and without a protective medium; the welding bead stays clean, with the vacuum preventing oxidation.

The procedure saves manual labor, metal and energy, with its productivity being clearly higher than that of any other procedure. Consequently, its field of applicability extends to machine building, aeronautics, nuclear technology, electrical engineering and so on.

An experimental model of an electron-beam installation is in operation at the Institute for Welding and Testing of Materials in Timisoara, where welding technologies have been devised for various products. The prototype of an installation for welding in a vacuum with an electron beam is in operation at the Institute for Nuclear Physics and Engineering (IFIN). An installation specifically for welding auto parts is undergoing technological tests. Two installations specifically for welding drilling bits are under construction at the Nuclear Apparatus Factory. An installation specifically for welding the pistons of supercharged diesel engines is in the process of being designed.

In the future programs, provision is made for the designing of general-purpose installations, along with other installations specifically for types of parts, thus securing the implementation of this modern technological procedure in industry.

Plasma Physics

Bucharest STIINTA SI TEHNICA in Romanian No 10, Oct 84 p 9

[Article by Dr C. Popovici and Dr G. Musa, Institute for the Physics and Technology of Radiation Instruments: "Plasma Physics: Installations, Technologies, Devices"]

[Text] The research and applications in the field of plasma physics, in the general context of the development of science in our country, have experienced a strong upswing in the last 10 years at the Central Institute of Physics (ICEFIZ).

Through the excellent material base and through the traditions of the Romanian school in the field of ionized gases, the subjects tackled, closely connected with the requirements for the development of industry and with the newest gains of science and technology on a world level, have had conditions needed for finding original Romanian solutions, which, more than once, have been the object of prize-winning inventions.

We will refer to a few of ICEFIZ's contributions to promoting in industry unconventional technologies with plasma with special implications, present and future.

The devising of installations with electron guns with plasma at ICEFIZ has paved the way for a wide range of completely new technologies. The high-density beams of energetic electrons permit the easy attainment, on solid targets, of temperatures of 1,000-3,500°C, corresponding to practically the majority of the "hot" technologies for the familiar materials. The installations with electron guns with plasma have a number of advantages: they operate at pressures on the order of 10^{-2} torr, much more accessible under the conditions of industrial applications, do not require electromagnetic focusing systems, have high outputs on the order of 70-80 percent and are simple and sturdy. The program that is going on within ICEFIZ seeks to devise electron guns with plasma in the range of low, medium and high powers and to devise installations and technologies in the field of the melting of hard-to-melt materials, high-speed heat treatments, deposits of thin layers by ionic plating, surface melting, impulse welding and crystal growth. The results obtained thus far indicate, in the case of high-speed heat treatments, the obtaining of tempered hardnesses and structures better than those obtained by conventional methods and, in the case of the depositing of thin layers, better properties of hardness, adhesion, layer thickness, corrosion resistance, homogeneity and so on. The decomposition of the molecules in the plasma and the formation of active atoms and excited and ionized species cause their reactivity with other molecules and with solid surfaces to be far greater than in the case of neutral atoms or molecules.

This property of plasma has opened up a wide avenue for another important class of unconventional technologies, namely that of reactive plasmas. A first achievement is the installation for etching with plasma, which permits the processing of electronic components in plasma, completely replacing the chemical procedures unsuited to the current requirements in microelectronics. The immersion in plasma, produced through a discharge in alternating current with a frequency of 13.56 MHz, leads, depending on the plasma-generating gas used, to the removal of the photoresist and the nitrides and to the etching of the silicon or the metallic deposits, with all these things happening in succession and at a controlled speed.

The installation, achieved completely at ICEFIZ, and the technology devised also open up interesting prospects for other applications in the field of fabric treatment in the textile industry, in biology, medicine, chemistry and so on, and in that of plasma chemistry, of the preparation of substances that cannot be obtained efficiently within classical chemistry.

The existence of active species of plasma provides for the achievement of completely special reaction rates in plasma, as it has been possible to test in the plasma reactor built at ICEFIZ.

High-energy particles of plasma have permitted the development of original technologies for "milling" with plasma, there being cut outlines of unusual forms, with depths on the order of $10\text{-}10^2$ nm, and there being used for this purpose heavy particles accelerated in plasma, incident, through a suitable shield, on the part being processed.

Before closing, we also mention the efforts of the specialists at ICEFIZ to assimilate in the country a number of ionic plasma devices, some of original design. We note: modern numerical-display systems, systems for alphanumeric display with plasma with over 16,000 distinct discharge points, corona voltage stabilizers, ultraviolet-radiation-detecting tubes, flashtubes, stroboscopic tubes, overvoltage protector tubes, quasi-monochromatic radiation tubes, cesium-activated thyratrons, signal diodes, hollow-cathode tubes and so on.

The excellent prospects that are being opened up for plasma physics--both in the field of basic studies and in that of applied research--and the continual requests by industry constitute a permanent mobilizing factor for the researchers in the field of plasma.

Laser Applications

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[Article by Dr V. Draganescu and Dr V. Vasiliu, Institute for the Physics and Technology of Radiation Instruments: "The Applications of Lasers"]

[Text] The Laser Section of the Institute for the Physics and Technology of Radiation Instruments (IFTAR) has centered its entire activity of technological research and engineering on creating complex equipment with lasers meant for the industries of machine-tool building, industrial construction and power

production, land improvements, the chemical industry, light industry, research and health.

There has been perfected a family of He-Ne laser equipment (LGA-2, LGA-3, ALGOLS, ELAC), used in: the steering, directing, guiding or control of the orientation of the equipment in excavating rock in the construction of tunnels for hydroelectric power stations (Lotru, Riul Mare); the railroad (Beia-Brasov, Mestecanis-Suceava, Birnova-Iasi, Curtea de Arges-Rimnicu Vilcea); the orientation of vertical sliding panels on high construction; control of the verticality of mine shafts in the Baia Mare and Valea Jiului mining basins; and the orientation of the digging of main galleries in coal mines.

A series of equipment (RTP-02, RTP-03), which materializes a reference plane by means of an He-Ne laser beam, has been perfected for land-improvement operations--leveling of agricultural land, removal of excess moisture from agricultural soil--and for the orientation of horizontal constructions of big dimensions. The utilization of this apparatus permits precision work with sevveral pieces of equipment at the same time (bulldozers, scrapers, motor graders) and nightwork.

The researchers at IFTAR and the Titan ICSIT [Institute for Scientific Research and Technological Engineering] have perfected for the machine-tool-building industry a family of He-Ne laser interferometers--LASINTERF--that permit the measurement of lengths and speeds with an accuracy of 1/10 micron. This apparatus has already gone into series production at the IAUC [Enterprise for Research Apparatus and Equipment] and FAN in Bucharest, with the customers being the machine-tool-building enterprises in Bucharest, Iasi, Arad, Craiova and Oradea. The designing of a modular system of He-Ne laser apparatus, capable of measuring all the parameters of interest in the machine-tool field, has been undertaken. This apparatus will permit the raising of the level of accuracy of the measurements and processing in this field of the national economy.

Another field to which special attention has been given is that of the processing of materials (the hardening of the surfaces of processed parts, welding, cutting, microboring) with a laser beam. For this there have been designed two carbon-dioxide-laser installations, capable of emitting beams whose power can exceed 1 kW and which permit processing of hard materials, cutting of stainless-steel pipe at very high speeds, cutting of siliceous plate, fine welding without deforming the surfaces subjected to processing, the hardening of cogwheel teeth, the hardening of mechanical components in constant motion in motors, precision microboring and so on. For each steel shield that must be hardened or for various types of mechanical parts whose surface must be hardened, it is necessary to perfect a specific technological process, on which work is done with excellent results in collaboration with the Bucharest ICSITEM [expansion unknown].

Another direction approached with great interest is that of measuring the degree of pollution in the residual water from the chemical and agricultural combines. Thus, there has been perfected a very complex, highly accurate, completely automated apparatus, based on a computer, for monitoring the triazines in the water of the purification stations of the Pitesti Chemical

Combine. The installation is capable of detecting pollutants within the limit of 10^{-3} ppm, which is already a high performance. The combines in Borzesti and Brazi will also benefit from this apparatus.

The researchers in the Laser Section of IFTAR, together with a number of physicians at the Central Military Hospital, have turned to the creation of a high-performance apparatus of great complexity for the public-health field. It is meant for operations on organs with a heavy blood flow (a laser scalpel), for the treatment of retinal and iris disorders, glaucoma and cataracts, for the biostimulation of the healing of sores or in acupuncture. After the clinical testing, this family, formed of five types of apparatus, is to be produced in series at the Enterprise for Research Apparatus and Equipment in Bucharest.

Materials with Special Properties

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[Article by Dr P. Nicolau and Dr A. Aldea, Institute for the Physics and Technology of Materials: "Materials with Special Physical and Mechanical Properties"]

[Text] The concerns connected with materials, including the study, production and utilization of them, represent a highly important aspect of any country's scientific and economic activity. The science of materials has acquired, more and more in recent times, an interdisciplinary character, attracting specialists from the fields of physics, chemistry, metallurgy, mechanics and so on.

Within the National Center for Physics there operates the Institute for the Physics and Technology of Materials (IFTM), whose activity is determined by the long-term requirements for new materials with special physical, chemical and mechanical properties and for components and devices based on these materials. The beneficiaries of this activity are the electronics, electrical-engineering, power-production, chemical and other industries.

Over the years, the institute has been developed continually and its material base for research and production has been expanded considerably, with the researchers attacking with great boldness new fields of the physics of materials. Thus, various classes of materials have been studied; we mention the semiconducting, magnetic, superconducting, ceramic and liquid-crystal ones. Many applications of them have as a basis, in particular, the knowing of their properties through typical complex solid-body research, achieved by the most varied methods, such as, for example, X-ray and neutron diffraction, electron microscopy, gamma-ray and optical spectrometry or specific methods of study of the electrical, magnetic, optical and other properties.

In the following, we will present, by way of example, just a few of the materials that have been obtained, studied and utilized at the institute. One of them, with many uses both in optoelectronics (luminescent diodes, displays, semiconductor lasers) and in microwave technology, is gallium arsenide and the related compounds (GaP, AlGaAs, InAs and so on). The whole range of materials

of this type has been studied and achieved at the IFTM, and work is now being done to diversify and expand the production of the components of interest to the national economy.

In addition, semiconducting barium titanate, a material with many characteristics, being semiconducting and ferroelectric at the same time, is used to make thermistors with a positive temperature coefficient. For many years, the production of them by the IFTM has covered the needs of the national economy in the field of transducers for thermal protection of electric machines.

The field of research on piezoceramic materials of the lead zirconate titanate type was recently tackled at the IFTM. The materials obtained are at the highest level in terms of performances, permitting the achievement of ultrasonic transducers of the best quality.

In the field of superconductivity, a big effort is being made to obtain materials with as high critical temperatures and fields as possible. The matter is obviously of great interest for applied research as well as for basic research, because some theories support the idea that critical temperatures have an upper limit, as an effect of the interactions existing on a microscopic scale. At the IFTM, the compound Nb_3Ge, which is the best superconducting material existing on a world level, has been obtained, and moreover, the technology for producing superconducting fibers by enclosing this material in suitable copper jackets has been achieved. Superconducting magnets capable of developing magnetic fields of 4.5 T have been made from superconducting fibers of Nb-Ti. The obtaining of such strong fields is of great importance in the study of the behavior of substances under extreme conditions, in the problem of thermonuclear fusion and so on. Since Nb is a scarce material, the research has also been oriented toward obtaining cheaper superconducting materials, such as, for example, $PbMo_6S_8$, with a critical temperature of 14.2 K.

In the future, the further development of the institute along the line of research on and application of the newest materials studied on a world level is foreseen.

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